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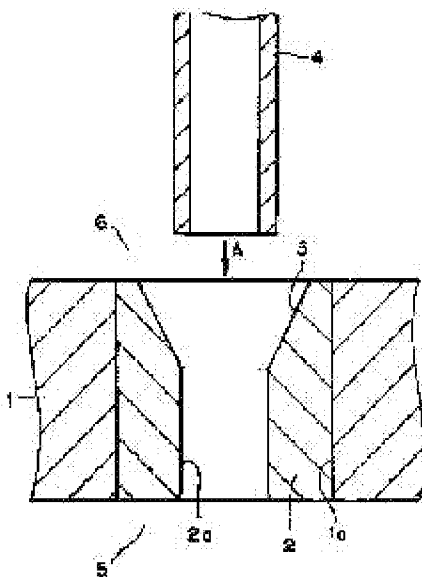
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(54) **METHOD FOR JOINTING TUBE**

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a method for fixing a tube to a hole in the body through a tube jointing member in which the tube and the tube jointing member can be assembled with no gap by setting the diameter of a tube insertion hole in the tube jointing member smaller than the outside diameter of the tube.

SOLUTION: In an ink jet recorder employing a tube for carrying a liquid or gas medium, a tube jointing member 2 is bonded through an adhesive to a hole 1a in the body 1 and a tube 4 is inserted into a hole 2a of the tube jointing member 2 and fixed in place. The tube 4 is made of vinyl chloride or a metallic material, e.g. copper, which is at least as hard as the tube jointing member 2. At the time of jointing tubes, the tube 4 is inserted in the direction of arrow A under a state where the jointing member 2 is bonded to the hole 1a in the body 1 in order to enlarge the inside diameter of the hole 2a equal to the outside diameter of the tube 4 thus fixing the tube tightly.



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CLAIMS

[Claim(s)]

[Claim 1] The tube junction approach characterized by constituting the tube insertion hole of tube joint material from a tube outer diameter with the small hole of a path in the tube junction approach of attaching a tube through tube joint material to the hole of the body which should be attached.

[Claim 2] The tube junction approach according to claim 1 characterized by forming cylinder-like slitting in the outer diameter of tube joint material at the tube path of insertion and a perpendicular.

[Claim 3] The tube junction approach according to claim 1 characterized by preparing two or more slitting of the shape of a cylinder formed in the tube path of insertion and a perpendicular.

[Claim 4] The tube junction approach according to claim 3 characterized by dividing into the tube path of insertion at least one of the cylindrical projections formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material.

[Claim 5] Claim 1 characterized by constituting the cylindrical projection outer-diameter point formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material on a concave surface thru/or the tube junction approach given in 4 any 1 terms.

[Claim 6] the tube path of insertion of tube joint material, and method ** of tube insertion at the tip of a cylindrical projection outer diameter formed of slitting of the shape of a cylinder formed in a perpendicular -- the tube junction approach according to claim 5 characterized by constituting a slot in the center section mostly.

[Claim 7] The tube junction approach according to claim 6 characterized by having the projection of said tube joint material, and the slot which fits in in some holes of the body with which tube joint material is inserted while preparing a projection in the periphery of tube joint material.

[Claim 8] The tube junction approach according to claim 7 characterized by having the projection of said tube, and the slot which fits in in a part of bore of tube joint material while preparing the large projection of a path in the periphery of a tube from an outer diameter.

[Claim 9] In the equipment which attaches and uses a tube through tube joint material to the hole of an attachment body, while forming a mounting hole in a curved surface to the tube path of insertion The tube junction approach according to claim 1 characterized by constituting the tube joint material surface which touches an attachment body hole from a curved surface of an attachment body hole on the curved surface where curvature is slightly big, and having the hole of a path slightly smaller than the outer diameter of a tube in tube joint material.

[Claim 10] The tube junction approach characterized by being used for the ink tank of an ink jet

printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the tube junction approach of equipment of performing conveyance of media, such as a liquid of an ink jet recording apparatus, or a gas, using a tube, and the junction approach of the ink tank of an ink jet recording apparatus, and an ink discharge head of printing an alphabetic character or an image by making ink breathing out especially.

[0002]

[Description of the Prior Art] Conventionally, in order to connect the feed zone of an ink discharge head, a liquid, or a gas in printers, such as an ink jet recording device which conveys media, such as a liquid or a gas, the activity which pipes a tube is done. As an example of the assembly approach of the tube in such the former, there is the junction approach shown in drawing 19.

[0003] As shown in drawing 19, it sets to the conventional approach. After the tube 102 which conveys a liquid or a gaseous medium is inserted in the hole 101 drilled by the body 100. The clearance between the hole 101 of a body 100 and a tube 102 is filled up with the sealing agents 103, i.e., a sealant, such as silicon and an epoxy resin, seal cutoff of between the storage room 104 of body 100 inside and outside and the open air 105 is carried out, and leakage of a liquid or a gas is prevented.

[0004]

[Problem(s) to be Solved by the Invention] However, according to the conventional approach shown in such drawing 19, in order to use the liquefied sealant 103, the problem of a sealant 103 mixing into a surroundings lump, a liquid, or a gas in a tube 102 from the clearance between the hole 101 of a body 100 and a tube 102 during a closure activity was seen. In addition, when taking several hours time amount to solidify from several minutes and performing assembly processing continuously, during assembly operation, a sealant 103 must store components temporarily in a storage area, and must perform sufficient hardening care of health.

[0005] Moreover, although there is also the press fit type junction approach by the sealant mentioned above which presses a tube 102 fit in the hole 101 of a body 100 directly **, if the outer diameter of a tube 102 and the bore of the hole 101 of a body 100 are not managed correctly, problems, such as causing the leakage of a liquid or a gas, will be seen.

[0006] In addition, since the assembly of it is impossible if the press fit type junction approach which presses a tube 102 fit in the hard body 100 does not adopt how to apply the force to detailed positioning to a tube 102 when inserting a tube 102 in a body 100, automation of an inclusion activity is very difficult for it.

[0007] Therefore, it is in the purpose of this invention offering the junction approach of the tube suitable for the automatic assembly which does not need the degree of how to apply detailed positioning or the force which do not need the latency time after required assembly by the approach of joining by the sealant, and are demanded by the press fit type junction approach in order to solve the problem in such the former, but can insert a tube easily.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the tube junction approach of this invention is characterized by constituting the tube insertion hole of tube joint material from a tube outer diameter with the small hole of a path in the tube junction approach of attaching a tube through tube joint material to the hole of the body which should be attached.

[0009] Moreover, the tube junction approach of this invention is characterized by forming cylinder-like slitting in the outer diameter of tube joint material at the tube path of insertion and a perpendicular.

[0010] Furthermore, the tube junction approach of this invention is characterized by preparing two or more slitting of the shape of a cylinder formed in the tube path of insertion and a perpendicular.

[0011] Furthermore, the tube junction approach of this invention is characterized by dividing into the tube path of insertion at least one of the cylindrical projections formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material again.

[0012] In addition, the tube junction approach of this invention is characterized by constituting the cylindrical projection outer-diameter point formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material on a concave surface again.

[0013] method ** of tube insertion at the tip of a cylindrical projection outer diameter in which the tube junction approach of this invention is formed of slitting of the shape of a cylinder by which it is formed in the tube path of insertion and the perpendicular of tube joint material -- it is characterized by constituting a slot in the center section mostly.

[0014] Moreover, the tube junction approach of this invention is characterized by having the projection of said tube joint material, and the slot which fits in in some holes of the body with which tube joint material is inserted while it prepares a projection in the periphery of tube joint material.

[0015] Furthermore, the tube junction approach of this invention is characterized by having the projection of said tube, and the slot which fits in in a part of bore of tube joint material while it prepares the large projection of a path in the periphery of a tube from an outer diameter.

[0016] Furthermore, while the tube junction approach of this invention forms a mounting hole in a curved surface to the tube path of insertion again in the equipment which attaches and uses a tube through tube joint material to the hole of an attachment body It is characterized by constituting the tube joint material surface which touches an attachment body hole from a curved surface of an attachment body hole on the curved surface where curvature is slightly big, and having the hole of a path slightly smaller than the outer diameter of a tube in tube joint material.

[0017] In addition, the tube junction approach of this invention is characterized by being used for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out again.

[0018] According to this invention, thus, the tube junction approach In the tube junction approach which attaches and uses a tube through tube joint material by the above configurations to the hole of the body which should be attached Since a little small hole constitutes the tube outer-diameter twist, tube joint material or a tube insertion hole Since it becomes possible to assemble the hole of a tube, tube joint material and tube joint material, and a body without a clearance and insertion of a tube becomes easy further only by inserting a tube in a hole The

reduction of riser activity cost of working capacity is attained. Assembly equipment with easy equipment since assembly is possible. The facility costs to equipment are also can also be reduced, and use of an automatic assembly machine becomes easy. Become easy [the correspondence to low cost and mass production method], and the displacement permissible dose of a tube joint is increased further again by forming slitting in the outer diameter of tube joint material in the above-mentioned equipment at the tube path of insertion and a perpendicular. Have and increase of the path clearance tolerance of a tube and tube joint material is enabled. By becoming possible to extend the deviation of a tube, or a tube joint material and a body hole, and there being effectiveness which makes processing of components easy, and making processing of components easy, quality control of components also becomes easy and, in addition, effectiveness is in reduction of components cost. Furthermore, by forming two or more slitting in tube joint material at the tube path of insertion and a perpendicular, in two or more fields perpendicular to the tube path of insertion, a liquid and a gas become possible [performing leakage control from a storage room to the open air in two or more steps], and can make more positive leakage control possible by this.

[0019] Moreover, by compounding and using the above-mentioned example, only in insertion actuation of a tube, immobilization of the mounting hole of a body, tube joint material and tube joint material, and a tube is enabled, and a liquid and a gas can be enabled to perform leakage control to coincidence from a storage room to the open air.

[0020] Three points of that there are many narrow arrangement spacing and volumes as a description in the ink of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image, and low cost are mentioned by making it breathe out ink to explain about the effectiveness at the time of using such this invention for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out. It explains to below in order about these.

[0021] Printing of a color picture is also possible for an ink jet printer in recent years, and it has two or more ink discharge heads corresponding to two or more colors, therefore two or more tubes for ink supply are needed similarly. Furthermore, since the ink discharge part is having structure which the ink discharge head corresponding to two or more colors accumulated, especially the ink supply tube to an ink discharge head must be arranged at narrow spacing. In addition, the head for ink jet printers can ask for the mass-production nature which mass-produces millions of pieces in the moon. Furthermore, corresponding to the price fall in a commercial scene in recent years, the assembly in low cost is searched for more.

[0022] Since the adhesion process which can arrange two or more tubes at narrow spacing since this invention can connect between ink discharge heads with an ink tank only by the tube insertion activity to the above demand items, can automate easily and requires time amount by termination in addition since the assembly in simple actuation is possible further again is made unnecessary, the correspondence to mass production method is attained. Furthermore, reduction of assembly cost can also be conjointly aimed at with assembly being possible at the automaton of a simple device, and working hours being early.

[0023] Other purposes, descriptions, and advantages of this invention will become clear from detailed explanation of the following in alignment with an accompanying drawing.

[0024]

[Embodiment of the Invention] Below, with reference to a drawing, it explains about the gestalt of desirable operation of the tube junction approach of this invention at a detail.

[0025] (Example 1) Drawing 1 and drawing 2 are the sectional views showing the 1st example of

the tube junction approach concerning this invention.

[0026] In the tube junction approach of this invention, the cylinder-like tube joint material 2 has fixed using proper adhesives to hole 1a prepared in the body 1 mostly, and a tube 4 is inserted in hole 2a of this tube joint material 2, and it is attached in it so that it may be illustrated.

[0027] In this example, being made from a rigid plastic ingredient is suitable for a body 1, in addition vinyl chloride, a fluororesin, a metal, wood, etc. are made from the proper hard ingredient.

[0028] Moreover, the tube joint material 2 is constituted by elastic members, such as silicone rubber and polyurethane rubber, and hole 2a for inserting and attaching a tube 4 and the inclined plane 3 where the proper taper for guiding a tube 4 to the tube path of insertion (the direction of drawing Nakaya mark A) was attached are formed. The tube 4 is carrying out the tube-like configuration and it is suitable for it metallic materials, such as polyethylene, polypropylene or vinyl chloride, and copper, and to be made from the tube joint material 2, an EQC, and a harder ingredient at least.

[0029] With such a body 1, the tube joint material 2, and a tube 4, first, as shown in drawing 1, by inserting a tube 4 in the direction of arrow-head A, after the tube joint material 2 has fixed to hole 1a of a body 1, the bore of hole 2a can extend the tube joint material 2 in the magnitude of the outer diameter of a tube 4, and it is attached in the condition of having stuck to the condition of drawing 2.

[0030] Therefore, since the tube joint material 2 is constituted by the elastic member in the condition of drawing 2 and it has the stability which is going to return to the condition of drawing 1, thrust is acted in the direction which pushes a tube 4 from the surroundings, the clearance between the tube joint material 2 and a tube 4 is filled, it maintains at ****, and it becomes possible to prevent leakage of a liquid or a gas from the storage room 5 to the open air 6 by this.

[0031] (Example 2) Drawing 3 and drawing 4 are the sectional views showing the 2nd example of the tube junction approach concerning this invention, and the same sign is attached to the same member as the 1st example shown in drawing 1, and they are made from the same ingredient. Therefore, in this example, a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, wood, etc. are made from a proper hard ingredient, the tube joint material 2 is made by elastic members, such as silicone rubber and polyurethane rubber, and a tube 4 is made from metallic materials, such as polyethylene, polypropylene or vinyl chloride, and copper, etc. for a body 1.

[0032] In drawing 3, mostly, the cylinder-like tube joint material 7 is formed so that it may have annular projection 8 and an annular, the shape of i.e., a ring, opening 9 in the field which touches hole 1a of a body 1 generally. Thus, in the 2nd constituted example, if a tube 4 is inserted in the direction of drawing Nakaya mark A, it will be in the condition of drawing 4. Where a tube 4 is inserted in the tube joint material 7, the bore of the tube joint material 7 can be extended to the outer diameter of a tube 4, so that it may be illustrated. Therefore, projection 8 is forced on the hole 1 of a body, and deforms. Since the tube joint material 7 is constituted by elastic members, such as silicone rubber and polyurethane rubber, and it has the stability which is going to return to the condition of drawing 3, projection 8 forces the tube joint material 7 on a tube 4 firmly in the location 10 where the joint material 7 on the same field as projection 8 touches a tube 4, forcing the tube joint material 7 on the hole 1 of a body.

[0033] That is, only in insertion actuation of a tube 4, it becomes possible to acquire the pressure between a tube 4, the tube joint material 7 and the tube joint material 7, and each of hole 1a of a

body 1, and adhesion maintenance is carried out and leakage of the liquid from the storage room 5 to the open air 6 or a gas is prevented by this.

[0034] Drawing 5 is the perspective view showing an example of the above-mentioned tube joint material 7. The projection 8 is formed in the shape of a three-step ring, and the ring-like projection 8 is constituted from this example by three steps.

[0035] That is, in this example, the tube joint material 7 becomes possible [intercepting the storage room 5 and the open air 6 to Mie], when pushed against hole 1a of a body 1, and a tube 4 by the projection 8 of the shape of three steps of rings. Therefore, only by the simple assembly operation which inserts a tube 4, hole 1a of a tube 4, the tube joint material 7 and the tube joint material 7, and a body 1 is covered in two or more steps, and this enables it to prevent leakage of the liquid from the storage room 5 to the open air 6, or a gas.

[0036] (Example 3) Drawing 6 is drawing showing the 3rd example using the sinking comb-like projections 11 and 12 which carved further into plurality the projection 8 of the shape of a ring shown in drawing 5 . Also in this example, a body 1 is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and the tube joint material 2 is made by elastic members, such as silicone rubber and polyurethane rubber.

[0037] Since there may be a danger that a forcing pressure will become an ununiformity and a multistage partition of the shape of a ring shown in drawing 5 will reduce the closure engine performance very rarely with the liquid by which the closure is carried out, a gas or tube joint material, and the quality of the material and the degree of hardness of a tube, either, as shown in drawing 6 , by this example, the projections 11 and 12 of the shape of a sinking comb made to lack a ring-like projection partially are formed in the tube joint material 7 as the preventive measures.

[0038] In a multistage partition of the shape of a ring shown by drawing 5 , the cause by which a forcing pressure becomes an ununiformity originates in only a local part spreading, without the tube joint material 7 carrying out the method of the homogeneous broadening corresponding to the breadth of the ideal tube joint material 7 at the time of tube insertion.

[0039] Next, the phenomenon in which only such a local part spreads is explained to a detail.

[0040] In drawing 3 and drawing 4 , in insertion to the tube joint material 7 of a tube 4 by the eccentricity of how to apply the force at the time of an activity, a tube 4, and the tube joint material 7, or the variation of an ingredient degree of hardness Without adopting the ideal way of spreading to a body 1, a variation rate may concentrate on the part in which the part spread early when the frictional force of breadth in addition the tube joint material 7, and the hole of a body 1 was big, and it may generate.

[0041] It becomes possible to form pressure distribution uniform to a circumferencial direction, since the sinking comb-like projections 11 and 12 can displace also to a circumferencial direction in the example shown in drawing 6 even if a variation rate concentrates on the part to which the part spread early in the ring [which is shown in drawing 5 on the other hand]-like projection 8 when frictional force with the hole of the breadth, in addition tube joint material 7 and a body was early large.

[0042] In addition, it is more desirable to constitute so that it may not suit in ***** to which the location of the projections 11 and 12 of each other changes from the core of the tube joint material 7 to a hand of cut (the drawing Nakaya mark B, the direction of C) and the location of projections 11 and 12 may be shifted and arranged, in two or more steps' going away and forming the gear-tooth-like projections 11 and 12, as shown in drawing 6 .

[0043] Moreover, although what is necessary be just to use them properly according to the

quality of the material degree of hardness of the property and tube joint material of a medium, or a tube to close, a sinking comb-like projection be effective [the projections] when the projections 11 and 12 of the shape of a sinking comb show in projection 8 and drawing 6 of the shape of a ring show in drawing 5 generally use an ingredient with high coefficient of friction of the hole of tube joint material and a body, as it be also in the above-mentioned explanation.

[0044] (Example 4) Drawing 7 and drawing 8 are the sectional views showing the 4th example of this invention which is the modification using this invention of the point of the projection 8 of the tube joint material in drawing 3 and drawing 4 . Also in this example, a body 1 is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and tube joint material is made by elastic members, such as silicone rubber and polyurethane rubber.

[0045] Drawing 7 is the sectional view having shown the point of the projection 14 of the tube joint material in the condition that tube joint material is not inserted in the hole of a body. The points 15 and 16 of projection 14 have the taper side shown by drawing 7 , respectively toward the thick direction (drawing Nakaya mark D, direction of E) core so that it may be illustrated.

[0046] Drawing 8 is the sectional view showing projection 14' of the tube joint material 7 when the tube joint material 7 shown by drawing 7 is included in hole 1a of a body 1 and a tube 4 is inserted.

[0047] since projection 14' is forced on hole 1a of a body 1 in this condition -- method ** of thick of the drawing Nakaya mark D and the direction of E -- mostly, from the center, an arrow-head D side spreads in the direction of arrow-head D, and the breadth, another side, and arrow-head E side has spread in the direction of arrow-head E.

[0048] Consequently, after tube assembly, the taper sides 15 and 16 in drawing 7 can maintain the condition of having stuck to hole 1a of a body 1 in respect of being large, as shown in drawing 8 .

[0049] Moreover, roll off, such as slitting of the shape of V character as shown in drawing 8 , U character-like slitting, or a slot, is prepared in the unification section 17 of the taper sides 15 and 16 of projection 14. projection point 14' of the tube joint material after the tube assembly shown in drawing 8 by forming these roll off 17 -- climax by center-section 17' can be prevented mostly, and adhesion of taper side 15' and 16' can be raised further.

[0050] (Example 5) Drawing 9 is the sectional view showing the 5th example of this invention, in this example, a body is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and the hole 18 of a body has a slot 19 and notching 20.

[0051] The tube joint material 21 which can be detached and attached freely is made by elastic members, such as silicone rubber and polyurethane rubber, fits into notching 20, runs against the slot 19 of the body hole 18, and the locating lug 22 which can be fitted in, is dashed and has the projection 23. The guide side 24 of the tube joint material 21 is a guide side when inserting a tube 4 in the tube joint material 21 from arrow-head G. Moreover, the hit side 25 of the tube joint material 21 makes a slot 19 carry out fitting of the projection 22, extending the projection 22 in breadth and the periphery section to the body hole 18, when a tube 4 is inserted.

[0052] While fixing the tube joint material 21 to the hole 18 of a body as shown to drawing 10 by by inserting a tube 4 from arrow-head G after inserting the tube joint material 21 in the hole 18 of a body from arrow-head G by constituting as mentioned above, a liquid or a gas can prevent revealing from a storage room to the open air. All of actuation of these single strings can be performed only from arrow-head G, and it is the same actuation, and immobilization and the

closure of the tube joint material 21 are made possible. Therefore, this invention becomes especially effective at the time of the assembly in an automaton.

[0053] (Example 6) Drawing 11 is the sectional view showing the 6th example of this invention.

[0054] In this example, the body is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluoro-resin, a metal, and wood. Furthermore, the tube joint material 28 is made by elastic members, such as silicone rubber and polyurethane rubber, and has the tube fitting slot 29. The tube 30 has the fitting projection 31 with a bigger path than a tube outer diameter. If a tube 30 is inserted in the direction of arrow-head H here, as shown in drawing 12, the projection of a tube 30 will be positioned in the fitting slot 29 of the tube joint material 28. That is, a series of actuation of all can be performed only from arrow-head H, and it is the same actuation, and the immobilization between a tube 30 and the tube joint material 28 and the closure are made possible.

[0055] (Example 7) Drawing 13 is the sectional view showing the 7th example of this invention.

In this example, a body 1 is made with a rigid plastic etc., and the tube joint material 32 is made by elastic members, such as silicone rubber and polyurethane rubber, and has the tube fitting slot 33 in a different location from hole 1a of a body 1. Therefore, the projection 35 of a tube 34 is being fixed as shown to the tube joint material 32 and drawing 13 by different location from hole 1a of a body 1.

[0056] In drawing 13, since the projection 35 of a tube 34 can insert from the direction of arrow-head F in the location which is not regulated by the outer diameter of the tube joint material 32 at hole 1a of the fitting slot 33 of the tube joint material 32, and a body 1, it can assemble by the force weaker than the 6th example shown in drawing 11.

[0057] Moreover, like the 6th example, while being able to perform a series of actuation of all only from arrow-head I, it is the same actuation and immobilization and the closure of the tube joint material 32 are made possible.

[0058] (Example 8) Drawing 14 and drawing 15 are the sectional views showing the 8th example of this invention. In drawing 14, a body is made from this example with a rigid plastic etc., it is made from it by elastic members, such as tube joint material 37 silicone rubber and polyurethane rubber, and a tube 4 is joined to the tube joint material 37. The body mating face 36 of the hole 35 of a body is formed on the curved surface, as shown in drawing 14. On the other hand, the tube joint material 37 consists of fields where curvature is bigger than the curved surface of the inside of the hole 35 of a body in the external surface which touches the hole 35 of a body. Therefore, between the tube joint material 37 and the hole 35 of a body, the clearance 42 is generated before insertion of a tube 4.

[0059] The inside 39 in which the tube 4 of the tube joint material 37 is inserted consists of paths slightly smaller than a tube 4.

[0060] Drawing 15 is the sectional view having shown the condition of having inserted the tube 4 in the hole 35 and the tube joint material 37 of the body shown by drawing 14. Inside 39' of the tube joint material 37 is pushed on a tube 4, and is mostly displaced in the straight-line gestalt. Outside 38' of the tube joint material 37 is performing the variation rate, imitating along with the mating face 36 of the hole 35 of a body in connection with the variation rate of inside 39'.

[0061] The leakage control from the storage room of the liquid by two or more projections which can be set in the 2nd example shown by drawing 3 and drawing 4 for explaining to a detail about this example below, or a gas to the open air is forced on the hole of a body, a projection outer diameter spreading at the time of tube insertion. Therefore, when an ingredient with strong

frictional resistance is especially used for tube joint material, the wrinkling and opening 43 of the tube path of insertion which the breadth of a projection outer diameter is checked in the part which touched the hole of a body early, and are shown in drawing 1616 may occur. Such a wrinkling and an opening 43 of the tube path of insertion tend to have a bad influence on the leakage control from the storage room 40 of a liquid or a gas to the open air 41.

[0062] On the other hand, in fitting of the curved-surface configuration shown by drawing 14 and drawing 15, a curved surface spreads also in the tube path of insertion with an outer diameter at the time of tube insertion. Therefore, even if it uses an ingredient with high frictional resistance for tube joint material, the wrinkling in the tube path of insertion and the vertical plane which are shown in drawing 17, or generating of an opening can be pressed down.

[0063] The wrinkling or opening of the tube path of insertion and a vertical plane cannot affect the leakage control from the storage room 40 of a liquid or a gas to the open air easily.

Therefore, in order to improve adhesion of a tube and tube joint material, and adhesion of tube joint material and a body hole, it is effective when using ** tube joint material and tube joint material with especially big frictional resistance.

[0064] As mentioned above, although explained about the 8th example from the 1st example, what is necessary is just the matter with which, as for tube joint material, it has flexibility in any case. Moreover, tube joint material can demonstrate the same effectiveness, whether it is generally joined to the hole or dissociates. Furthermore, it is also an effective means to compound and use the approach stated in the eighth example from the first example.

[0065] (Example 9) Drawing 18 is a perspective view for explanation at the time of using this invention for the ink supply to the ink discharge head of the ink jet printer which can print an alphabetic character and an image from an ink tank by making ink breathe out this invention mentioned above.

[0066] The printing section 42 of an ink jet printer consists of an ink discharge head 43, an ink tank 44, and tubes 45, 46, 47, and 48 for supplying ink to the ink discharge head 43 from the ink tank 44. The ink discharge head 43 consists of very small holes which are not illustrated and which were located in a line two or more pieces possible [the regurgitation / the ink of four colors] in the direction of arrow-head in drawing J. In order to supply ink, the holes 50, 51, 52, and 53 for ink supply are formed in the field 49 of the ink discharge head 43.

[0067] In this example, the hole 53 of the for the ink of a MAZENDA color and for supply in the hole 52 of the for yellow ink and for supply in the hole 51 for black ink and supply in the hole 50 for supply is set as the feed holes of the ink of a cyanogen color. The ink tank 44 is constituted by the black tank 54, the yellow tank 55, the MAZENDA color ink tank 56, and the cyanogen color ink tank 57 according to the ink of four colors used for printing. Moreover, in addition it is constituted by the tube 45 for black, the tube 55 for yellow, the tube 56 for MAZENDA colors, and the tube 57 for cyanogen colors according to four colors used for printing like [a tube] an ink tank, the tube is incorporated with the feed holes of an ink discharge head and an ink tank through the tube joint material 58 of this invention.

[0068] Each approaches, the tube is arranged and it is especially understood in the ink discharge head 43 that it must pipe densely so that clearly from drawing 18.

[0069]

[Effect of the Invention] As explained above, the tube junction approach of this invention according to claim 1 In the tube junction approach of attaching a tube through tube joint material to the hole of the body which should be attached, since the small hole of a path constitutes the tube insertion hole of tube joint material from the tube outer diameter Since it becomes possible

to assemble a hole without a clearance generally with a tube, tube joint material, and tube joint material and insertion of a tube becomes easy still as mentioned above only by inserting a tube in the hole of a body. While working efficiency improves and reduction of activity cost is attained, since the assembly also of assembly equipment becomes possible with simple equipment, the facility costs to equipment are also can also be reduced, further, use of an automatic assembly machine becomes easy and the correspondence to low cost and mass production method also becomes easy.

[0070] The tube junction approach of this invention according to claim 2 To the outer diameter of tube joint material, since cylinder-like slitting is formed in the tube path of insertion and a perpendicular. The displacement permissible dose of a tube joint is increased and it becomes possible to extend the deviation of a tube, and a tube joint material and a body hole. There is effectiveness which makes processing of components easy, by making processing of components easy in this way, quality control of components also becomes easy and, in addition, effectiveness is in reduction of components cost.

[0071] Since two or more slitting of the shape of a cylinder formed in the tube path of insertion and a perpendicular is prepared, in two or more fields perpendicular to the tube path of insertion, a liquid and a gas are enabled to perform leakage control from a storage room to the open air in two or more steps, and the tube junction approach of this invention according to claim 3 can make positive leakage control possible by this.

[0072] Since the tube junction approach of this invention according to claim 4 is dividing into the tube path of insertion at least one of the cylindrical projections formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material, it can make it possible to equalize pressure on a periphery also in tube joint material with big frictional resistance at a circumferencial direction, and can make positive leakage control possible by this.

[0073] Since the tube junction approach of this invention according to claim 5 constitutes the cylindrical projection outer-diameter point formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material on a concave surface, the touch area to the body hole of tube joint material is made to increase, and still more positive liquid and gas can perform leakage control from a storage room to the open air.

[0074] method ** of tube insertion at the tip of a cylindrical projection outer diameter in which the tube junction approach of this invention according to claim 6 is formed of slitting of the shape of a cylinder by which it is formed in the tube path of insertion and the perpendicular of tube joint material -- since the slot is mostly constituted in the center section, a liquid and a gas become possible much more certainly from a storage room about leakage control to the open air by the projection of tube joint material swelling in the center, and preventing producing an opening after tube insertion.

[0075] The tube junction approach of this invention according to claim 7 Since it has the projection of said tube joint material, and the slot which fits in in some holes of the body with which tube joint material is inserted while preparing a projection in the periphery of tube joint material the escape of the outer diameter of the tube joint material at the time of tube insertion -- it becomes possible by making tube joint material insert in the above-mentioned slot using a variation rate to fix tube joint material to the hole of a body only by insertion of a tube.

[0076] While the tube junction approach of this invention according to claim 8 prepares the large projection of a path in the periphery of a tube from an outer diameter, since it has the projection of said tube, and the slot which fits in in a part of bore of tube joint material, it is only inserting a

tube and it becomes possible to fix a tube to tube joint material.

[0077] The tube junction approach of this invention according to claim 9 In the equipment which attaches and uses a tube through tube joint material to the hole of an attachment body, while forming a mounting hole in a curved surface to the tube path of insertion Since the tube joint material surface which touches an attachment body hole is constituted from a curved surface of an attachment body hole on the curved surface where curvature is slightly big and it has the hole of a path slightly smaller than the outer diameter of a tube in tube joint material The opening of the tube path of insertion between a body hole and tube joint material is prevented, and a liquid and a gas become more certainly possible from a storage room about leakage control to the open air.

[0078] Since the tube junction approach of this invention according to claim 10 is used for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out, it is applicable to the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out. Moreover, since between an ink tank and ink discharge heads can be connected by insertion of a tube, reduction of assembly cost can be conjointly aimed at with the assembly in simple actuation [arrange / at narrow spacing / it / and] being possible in two or more tubes, the correspondence to mass production method being possible, assembly being possible at the automatic machine of a still easier device, and working hours being early.

[0079] Furthermore, by compounding and using the above-mentioned example, immobilization of the mounting hole of a body, tube joint material and tube joint material, and a tube is enabled only in insertion actuation of a tube, and a liquid and a gas become more certainly possible from a storage room about leakage control to the open air at coincidence.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the tube junction approach of equipment of performing conveyance of media, such as a liquid of an ink jet recording apparatus, or a gas, using a tube, and the junction approach of the ink tank of an ink jet recording apparatus, and an ink discharge head of printing an alphabetic character or an image by making ink breathing out especially.

PRIOR ART

[Description of the Prior Art] Conventionally, in order to connect the feed zone of an ink discharge head, a liquid, or a gas in printers, such as an ink jet recording device which conveys media, such as a liquid or a gas, the activity which pipes a tube is done. As an example of the assembly approach of the tube in such the former, there is the junction approach shown in drawing 19 .

[0003] As shown in drawing 19 , it sets to the conventional approach. After the tube 102 which conveys a liquid or a gaseous medium is inserted in the hole 101 drilled by the body 100 The clearance between the hole 101 of a body 100 and a tube 102 is filled up with the sealing agents 103, i.e., a sealant, such as silicon and an epoxy resin, seal cutoff of between the storage room

104 of body 100 inside and outside and the open air 105 is carried out, and leakage of a liquid or a gas is prevented.

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, the tube junction approach of this invention according to claim 1 In the tube junction approach of attaching a tube through tube joint material to the hole of the body which should be attached, since the small hole of a path constitutes the tube insertion hole of tube joint material from the tube outer diameter Since it becomes possible to assemble a hole without a clearance generally with a tube, tube joint material, and tube joint material and insertion of a tube becomes easy still as mentioned above only by inserting a tube in the hole of a body While working efficiency improves and reduction of activity cost is attained, since the assembly also of assembly equipment becomes possible with simple equipment, the facility costs to equipment are also can also be reduced, further, use of an automatic assembly machine becomes easy and the correspondence to low cost and mass production method also becomes easy.

[0070] The tube junction approach of this invention according to claim 2 To the outer diameter of tube joint material, since cylinder-like slitting is formed in the tube path of insertion and a perpendicular The displacement permissible dose of a tube joint is increased and it becomes possible to extend the deviation of a tube, and a tube joint material and a body hole. There is effectiveness which makes processing of components easy, by making processing of components easy in this way, quality control of components also becomes easy and, in addition, effectiveness is in reduction of components cost.

[0071] Since two or more slitting of the shape of a cylinder formed in the tube path of insertion and a perpendicular is prepared, in two or more fields perpendicular to the tube path of insertion, a liquid and a gas are enabled to perform leakage control from a storage room to the open air in two or more steps, and the tube junction approach of this invention according to claim 3 can make positive leakage control possible by this.

[0072] Since the tube junction approach of this invention according to claim 4 is dividing into the tube path of insertion at least one of the cylindrical projections formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material, it can make it possible to equalize pressure on a periphery also in tube joint material with big frictional resistance at a circumferencial direction, and can make positive leakage control possible by this.

[0073] Since the tube junction approach of this invention according to claim 5 constitutes the cylindrical projection outer-diameter point formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material on a concave surface, the touch area to the body hole of tube joint material is made to increase, and still more positive liquid and gas can perform leakage control from a storage room to the open air.

[0074] method ** of tube insertion at the tip of a cylindrical projection outer diameter in which the tube junction approach of this invention according to claim 6 is formed of slitting of the shape of a cylinder by which it is formed in the tube path of insertion and the perpendicular of tube joint material -- since the slot is mostly constituted in the center section, a liquid and a gas become possible much more certainly from a storage room about leakage control to the open air by the projection of tube joint material swelling in the center, and preventing producing an

opening after tube insertion.

[0075] The tube junction approach of this invention according to claim 7 Since it has the projection of said tube joint material, and the slot which fits in in some holes of the body with which tube joint material is inserted while preparing a projection in the periphery of tube joint material the escape of the outer diameter of the tube joint material at the time of tube insertion -- it becomes possible by making tube joint material insert in the above-mentioned slot using a variation rate to fix tube joint material to the hole of a body only by insertion of a tube.

[0076] While the tube junction approach of this invention according to claim 8 prepares the large projection of a path in the periphery of a tube from an outer diameter, since it has the projection of said tube, and the slot which fits in in a part of bore of tube joint material, it is only inserting a tube and it becomes possible to fix a tube to tube joint material.

[0077] The tube junction approach of this invention according to claim 9 In the equipment which attaches and uses a tube through tube joint material to the hole of an attachment body, while forming a mounting hole in a curved surface to the tube path of insertion Since the tube joint material surface which touches an attachment body hole is constituted from a curved surface of an attachment body hole on the curved surface where curvature is slightly big and it has the hole of a path slightly smaller than the outer diameter of a tube in tube joint material The opening of the tube path of insertion between a body hole and tube joint material is prevented, and a liquid and a gas become more certainly possible from a storage room about leakage control to the open air.

[0078] Since the tube junction approach of this invention according to claim 10 is used for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out, it is applicable to the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out. Moreover, since between an ink tank and ink discharge heads can be connected by insertion of a tube, reduction of assembly cost can be conjointly aimed at with the assembly in simple actuation [arrange / at narrow spacing / it / and] being possible in two or more tubes, the correspondence to mass production method being possible, assembly being possible at the automatic machine of a still easier device, and working hours being early.

[0079] Furthermore, by compounding and using the above-mentioned example, immobilization of the mounting hole of a body, tube joint material and tube joint material, and a tube is enabled only in insertion actuation of a tube, and a liquid and a gas become more certainly possible from a storage room about leakage control to the open air at coincidence.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, according to the conventional approach shown in such drawing 19 , in order to use the liquefied sealant 103, the problem of a sealant 103 mixing into a surroundings lump, a liquid, or a gas in a tube 102 from the clearance between the hole 101 of a body 100 and a tube 102 during a closure activity was seen. In addition, when taking several hours time amount to solidify from several minutes and performing assembly processing continuously, during assembly operation, a sealant 103 must store components temporarily in a storage area, and must perform sufficient hardening care of health.

[0005] Moreover, although there is also the press fit type junction approach by the sealant

mentioned above which presses a tube 102 fit in the hole 101 of a body 100 directly **, if the outer diameter of a tube 102 and the bore of the hole 101 of a body 100 are not managed correctly, problems, such as causing the leakage of a liquid or a gas, will be seen.

[0006] In addition, since the assembly of it is impossible if the press fit type junction approach which presses a tube 102 fit in the hard body 100 does not adopt how to apply the force to detailed positioning to a tube 102 when inserting a tube 102 in a body 100, automation of an inclusion activity is very difficult for it.

[0007] Therefore, it is in the purpose of this invention offering the junction approach of the tube suitable for the automatic assembly which does not need the degree of how to apply detailed positioning or the force which do not need the latency time after required assembly by the approach of joining by the sealant, and are demanded by the press fit type junction approach in order to solve the problem in such the former, but can insert a tube easily.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the tube junction approach of this invention is characterized by constituting the tube insertion hole of tube joint material from a tube outer diameter with the small hole of a path in the tube junction approach of attaching a tube through tube joint material to the hole of the body which should be attached.

[0009] Moreover, the tube junction approach of this invention is characterized by forming cylinder-like slitting in the outer diameter of tube joint material at the tube path of insertion and a perpendicular.

[0010] Furthermore, the tube junction approach of this invention is characterized by preparing two or more slitting of the shape of a cylinder formed in the tube path of insertion and a perpendicular.

[0011] Furthermore, the tube junction approach of this invention is characterized by dividing into the tube path of insertion at least one of the cylindrical projections formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material again.

[0012] In addition, the tube junction approach of this invention is characterized by constituting the cylindrical projection outer-diameter point formed of slitting of the shape of a cylinder formed in the tube path of insertion and the perpendicular of tube joint material on a concave surface again.

[0013] method ** of tube insertion at the tip of a cylindrical projection outer diameter in which the tube junction approach of this invention is formed of slitting of the shape of a cylinder by which it is formed in the tube path of insertion and the perpendicular of tube joint material -- it is characterized by constituting a slot in the center section mostly.

[0014] Moreover, the tube junction approach of this invention is characterized by having the projection of said tube joint material, and the slot which fits in in some holes of the body with which tube joint material is inserted while it prepares a projection in the periphery of tube joint material.

[0015] Furthermore, the tube junction approach of this invention is characterized by having the projection of said tube, and the slot which fits in in a part of bore of tube joint material while it prepares the large projection of a path in the periphery of a tube from an outer diameter.

[0016] Furthermore, while the tube junction approach of this invention forms a mounting hole in a curved surface to the tube path of insertion again in the equipment which attaches and uses a tube through tube joint material to the hole of an attachment body It is characterized by constituting the tube joint material surface which touches an attachment body hole from a curved surface of an attachment body hole on the curved surface where curvature is slightly big, and having the hole of a path slightly smaller than the outer diameter of a tube in tube joint material.

[0017] In addition, the tube junction approach of this invention is characterized by being used for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out again.

[0018] According to this invention, thus, the tube junction approach In the tube junction approach which attaches and uses a tube through tube joint material by the above configurations to the hole of the body which should be attached Since a little small hole constitutes the tube outer-diameter twist, tube joint material or a tube insertion hole Since it becomes possible to assemble the hole of a tube, tube joint material and tube joint material, and a body without a clearance and insertion of a tube becomes easy further only by inserting a tube in a hole The reduction of riser activity cost of working capacity is attained. Assembly equipment with easy equipment since assembly is possible The facility costs to equipment are also can also be reduced, and use of an automatic assembly machine becomes easy. Become easy [the correspondence to low cost and mass production method], and the displacement permissible dose of a tube joint is increased further again by forming slitting in the outer diameter of tube joint material in the above-mentioned equipment at the tube path of insertion and a perpendicular. Have and increase of the path clearance tolerance of a tube and tube joint material is enabled. By becoming possible to extend the deviation of a tube, or a tube joint material and a body hole, and there being effectiveness which makes processing of components easy, and making processing of components easy, quality control of components also becomes easy and, in addition, effectiveness is in reduction of components cost. Furthermore, by forming two or more slitting in tube joint material at the tube path of insertion and a perpendicular, in two or more fields perpendicular to the tube path of insertion, a liquid and a gas become possible [performing leakage control from a storage room to the open air in two or more steps], and can make more positive leakage control possible by this.

[0019] Moreover, by compounding and using the above-mentioned example, only in insertion actuation of a tube, immobilization of the mounting hole of a body, tube joint material and tube joint material, and a tube is enabled, and a liquid and a gas can be enabled to perform leakage control to coincidence from a storage room to the open air.

[0020] Three points of that there are many narrow arrangement spacing and volumes as a description in the ink of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image, and low cost are mentioned by making it breathe out ink to explain about the effectiveness at the time of using such this invention for the ink tank of an ink jet printer and the connection of an ink discharge head which can print an alphabetic character or an image by making ink breathe out. It explains to below in order about these.

[0021] Printing of a color picture is also possible for an ink jet printer in recent years, and it has two or more ink discharge heads corresponding to two or more colors, therefore two or more tubes for ink supply are needed similarly. Furthermore, since the ink discharge part is having structure which the ink discharge head corresponding to two or more colors accumulated, especially the ink supply tube to an ink discharge head must be arranged at narrow spacing. In addition, the head for ink jet printers can ask for the mass-production nature which mass-

produces millions of pieces in the moon. Furthermore, corresponding to the price fall in a commercial scene in recent years, the assembly in low cost is searched for more.

[0022] Since the adhesion process which can arrange two or more tubes at narrow spacing since this invention can connect between ink discharge heads with an ink tank only by the tube insertion activity to the above demand items, can automate easily and requires time amount by termination in addition since the assembly in simple actuation is possible further again is made unnecessary, the correspondence to mass production method is attained. Furthermore, reduction of assembly cost can also be conjointly aimed at with assembly being possible at the automaton of a simple device, and working hours being early.

[0023] Other purposes, descriptions, and advantages of this invention will become clear from detailed explanation of the following in alignment with an accompanying drawing.

[0024]

[Embodiment of the Invention] Below, with reference to a drawing, it explains about the gestalt of desirable operation of the tube junction approach of this invention at a detail.

[0025] (Example 1) Drawing 1 and drawing 2 are the sectional views showing the 1st example of the tube junction approach concerning this invention.

[0026] In the tube junction approach of this invention, the cylinder-like tube joint material 2 has fixed using proper adhesives to hole 1a prepared in the body 1 mostly, and a tube 4 is inserted in hole 2a of this tube joint material 2, and it is attached in it so that it may be illustrated.

[0027] In this example, being made from a rigid plastic ingredient is suitable for a body 1, in addition vinyl chloride, a fluororesin, a metal, wood, etc. are made from the proper hard ingredient.

[0028] Moreover, the tube joint material 2 is constituted by elastic members, such as silicone rubber and polyurethane rubber, and hole 2a for inserting and attaching a tube 4 and the inclined plane 3 where the proper taper for guiding a tube 4 to the tube path of insertion (the direction of drawing Nakaya mark A) was attached are formed. The tube 4 is carrying out the tube-like configuration and it is suitable for it metallic materials, such as polyethylene, polypropylene or vinyl chloride, and copper, and to be made from the tube joint material 2, an EQC, and a harder ingredient at least.

[0029] With such a body 1, the tube joint material 2, and a tube 4, first, as shown in drawing 1, by inserting a tube 4 in the direction of arrow-head A, after the tube joint material 2 has fixed to hole 1a of a body 1, the bore of hole 2a can extend the tube joint material 2 in the magnitude of the outer diameter of a tube 4, and it is attached in the condition of having stuck to the condition of drawing 2.

[0030] Therefore, since the tube joint material 2 is constituted by the elastic member in the condition of drawing 2 and it has the stability which is going to return to the condition of drawing 1, thrust is acted in the direction which pushes a tube 4 from the surroundings, the clearance between the tube joint material 2 and a tube 4 is filled, it maintains at ****, and it becomes possible to prevent leakage of a liquid or a gas from the storage room 5 to the open air 6 by this.

[0031] (Example 2) Drawing 3 and drawing 4 are the sectional views showing the 2nd example of the tube junction approach concerning this invention, and the same sign is attached to the same member as the 1st example shown in drawing 1, and they are made from the same ingredient. Therefore, in this example, a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, wood, etc. are made from a proper hard ingredient, the tube joint material 2 is made by elastic members, such as silicone rubber and polyurethane rubber, and a tube 4 is made from

metallic materials, such as polyethylene, polypropylene or vinyl chloride, and copper, etc. for a body 1.

[0032] In drawing 3, mostly, the cylinder-like tube joint material 7 is formed so that it may have annular projection 8 and an annular, the shape of i.e., a ring, opening 9 in the field which touches hole 1a of a body 1 generally. Thus, in the 2nd constituted example, if a tube 4 is inserted in the direction of drawing Nakaya mark A, it will be in the condition of drawing 4. Where a tube 4 is inserted in the tube joint material 7, the bore of the tube joint material 7 can be extended to the outer diameter of a tube 4, so that it may be illustrated. Therefore, projection 8 is forced on the hole 1 of a body, and deforms. Since the tube joint material 7 is constituted by elastic members, such as silicone rubber and polyurethane rubber, and it has the stability which is going to return to the condition of drawing 3, projection 8 forces the tube joint material 7 on a tube 4 firmly in the location 10 where the joint material 7 on the same field as projection 8 touches a tube 4, forcing the tube joint material 7 on the hole 1 of a body.

[0033] That is, only in insertion actuation of a tube 4, it becomes possible to acquire the pressure between a tube 4, the tube joint material 7 and the tube joint material 7, and each of hole 1a of a body 1, and adhesion maintenance is carried out and leakage of the liquid from the storage room 5 to the open air 6 or a gas is prevented by this.

[0034] Drawing 5 is the perspective view showing an example of the above-mentioned tube joint material 7. The projection 8 is formed in the shape of a three-step ring, and the ring-like projection 8 is constituted from this example by three steps.

[0035] That is, in this example, the tube joint material 7 becomes possible [intercepting the storage room 5 and the open air 6 to Mie], when pushed against hole 1a of a body 1, and a tube 4 by the projection 8 of the shape of three steps of rings. Therefore, only by the simple assembly operation which inserts a tube 4, hole 1a of a tube 4, the tube joint material 7 and the tube joint material 7, and a body 1 is covered in two or more steps, and this enables it to prevent leakage of the liquid from the storage room 5 to the open air 6, or a gas.

[0036] (Example 3) Drawing 6 is drawing showing the 3rd example using the sinking comb-like projections 11 and 12 which carved further into plurality the projection 8 of the shape of a ring shown in drawing 5. Also in this example, a body 1 is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and the tube joint material 2 is made by elastic members, such as silicone rubber and polyurethane rubber.

[0037] Since there may be a danger that a forcing pressure will become an ununiformity and a multistage partition of the shape of a ring shown in drawing 5 will reduce the closure engine performance very rarely with the liquid by which the closure is carried out, a gas or tube joint material, and the quality of the material and the degree of hardness of a tube, either, as shown in drawing 6, by this example, the projections 11 and 12 of the shape of a sinking comb made to lack a ring-like projection partially are formed in the tube joint material 7 as the preventive measures.

[0038] In a multistage partition of the shape of a ring shown by drawing 5, the cause by which a forcing pressure becomes an ununiformity originates in only a local part spreading, without the tube joint material 7 carrying out the method of the homogeneous broadening corresponding to the breadth of the ideal tube joint material 7 at the time of tube insertion.

[0039] Next, the phenomenon in which only such a local part spreads is explained to a detail.

[0040] In drawing 3 and drawing 4, in insertion to the tube joint material 7 of a tube 4 by the eccentricity of how to apply the force at the time of an activity, a tube 4, and the tube joint material 7, or the variation of an ingredient degree of hardness Without adopting the ideal way of

spreading to a body 1, a variation rate may concentrate on the part in which the part spread early when the frictional force of breadth in addition the tube joint material 7, and the hole of a body 1 was big, and it may generate.

[0041] It becomes possible to form pressure distribution uniform to a circumferencial direction, since the sinking comb-like projections 11 and 12 can displace also to a circumferencial direction in the example shown in drawing 6 even if a variation rate concentrates on the part to which the part spread early in the ring [which is shown in drawing 5 on the other hand]-like projection 8 when frictional force with the hole of the breadth, in addition tube joint material 7 and a body was early large.

[0042] In addition, it is more desirable to constitute so that it may not suit in ***** to which the location of the projections 11 and 12 of each other changes from the core of the tube joint material 7 to a hand of cut (the drawing Nakaya mark B, the direction of C) and the location of projections 11 and 12 may be shifted and arranged, in two or more steps' going away and forming the gear-tooth-like projections 11 and 12, as shown in drawing 6 .

[0043] Moreover, although what is necessary be just to use them properly according to the quality of the material degree of hardness of the property and tube joint material of a medium, or a tube to close, a sinking comb-like projection be effective [the projections] when the projections 11 and 12 of the shape of a sinking comb show in projection 8 and drawing 6 of the shape of a ring show in drawing 5 generally use an ingredient with high coefficient of friction of the hole of tube joint material and a body, as it be also in the above-mentioned explanation.

[0044] (Example 4) Drawing 7 and drawing 8 are the sectional views showing the 4th example of this invention which is the modification using this invention of the point of the projection 8 of the tube joint material in drawing 3 and drawing 4 . Also in this example, a body 1 is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and tube joint material is made by elastic members, such as silicone rubber and polyurethane rubber.

[0045] Drawing 7 is the sectional view having shown the point of the projection 14 of the tube joint material in the condition that tube joint material is not inserted in the hole of a body. The points 15 and 16 of projection 14 have the taper side shown by drawing 7 , respectively toward the thick direction (drawing Nakaya mark D, direction of E) core so that it may be illustrated.

[0046] Drawing 8 is the sectional view showing projection 14' of the tube joint material 7 when the tube joint material 7 shown by drawing 7 is included in hole 1a of a body 1 and a tube 4 is inserted.

[0047] since projection 14' is forced on hole 1a of a body 1 in this condition -- method ** of thick of the drawing Nakaya mark D and the direction of E -- mostly, from the center, an arrow-head D side spreads in the direction of arrow-head D, and the breadth, another side, and arrow-head E side has spread in the direction of arrow-head E.

[0048] Consequently, after tube assembly, the taper sides 15 and 16 in drawing 7 can maintain the condition of having stuck to hole 1a of a body 1 in respect of being large, as shown in drawing 8 .

[0049] Moreover, roll off, such as slitting of the shape of V character as shown in drawing 8 , U character-like slitting, or a slot, is prepared in the unification section 17 of the taper sides 15 and 16 of projection 14. projection point 14' of the tube joint material after the tube assembly shown in drawing 8 by forming these roll off 17 -- climax by center-section 17' can be prevented mostly, and adhesion of taper side 15' and 16' can be raised further.

[0050] (Example 5) Drawing 9 is the sectional view showing the 5th example of this invention,

in this example, a body is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood, and the hole 18 of a body has a slot 19 and notching 20.

[0051] The tube joint material 21 which can be detached and attached freely is made by elastic members, such as silicone rubber and polyurethane rubber, fits into notching 20, runs against the slot 19 of the body hole 18, and the locating lug 22 which can be fitted in, is dashed and has the projection 23. The guide side 24 of the tube joint material 21 is a guide side when inserting a tube 4 in the tube joint material 21 from arrow-head G. Moreover, the hit side 25 of the tube joint material 21 makes a slot 19 carry out fitting of the projection 22, extending the projection 22 in breadth and the periphery section to the body hole 18, when a tube 4 is inserted.

[0052] While fixing the tube joint material 21 to the hole 18 of a body as shown to drawing 10 by inserting a tube 4 from arrow-head G after inserting the tube joint material 21 in the hole 18 of a body from arrow-head G by constituting as mentioned above, a liquid or a gas can prevent revealing from a storage room to the open air. All of actuation of these single strings can be performed only from arrow-head G, and it is the same actuation, and immobilization and the closure of the tube joint material 21 are made possible. Therefore, this invention becomes especially effective at the time of the assembly in an automaton.

[0053] (Example 6) Drawing 11 is the sectional view showing the 6th example of this invention.

[0054] In this example, the body is made from proper hard ingredients, such as a rigid plastic ingredient, vinyl chloride and a fluororesin, a metal, and wood. Furthermore, the tube joint material 28 is made by elastic members, such as silicone rubber and polyurethane rubber, and has the tube fitting slot 29. The tube 30 has the fitting projection 31 with a bigger path than a tube outer diameter. If a tube 30 is inserted in the direction of arrow-head H here, as shown in drawing 12, the projection of a tube 30 will be positioned in the fitting slot 29 of the tube joint material 28. That is, a series of actuation of all can be performed only from arrow-head H, and it is the same actuation, and the immobilization between a tube 30 and the tube joint material 28 and the closure are made possible.

[0055] (Example 7) Drawing 13 is the sectional view showing the 7th example of this invention. In this example, a body 1 is made with a rigid plastic etc., and the tube joint material 32 is made by elastic members, such as silicone rubber and polyurethane rubber, and has the tube fitting slot 33 in a different location from hole 1a of a body 1. Therefore, the projection 35 of a tube 34 is being fixed as shown to the tube joint material 32 and drawing 13 by different location from hole 1a of a body 1.

[0056] In drawing 13, since the projection 35 of a tube 34 can insert from the direction of arrow-head F in the location which is not regulated by the outer diameter of the tube joint material 32 at hole 1a of the fitting slot 33 of the tube joint material 32, and a body 1, it can assemble by the force weaker than the 6th example shown in drawing 11.

[0057] Moreover, like the 6th example, while being able to perform a series of actuation of all only from arrow-head I, it is the same actuation and immobilization and the closure of the tube joint material 32 are made possible.

[0058] (Example 8) Drawing 14 and drawing 15 are the sectional views showing the 8th example of this invention. In drawing 14, a body is made from this example with a rigid plastic etc., it is made from it by elastic members, such as tube joint material 37 silicone rubber and polyurethane rubber, and a tube 4 is joined to the tube joint material 37. The body mating face 36 of the hole 35 of a body is formed on the curved surface, as shown in drawing 14. On the other hand, the tube joint material 37 consists of fields where curvature is bigger than the curved surface of the

inside of the hole 35 of a body in the external surface which touches the hole 35 of a body. Therefore, between the tube joint material 37 and the hole 35 of a body, the clearance 42 is generated before insertion of a tube 4.

[0059] The inside 39 in which the tube 4 of the tube joint material 37 is inserted consists of paths slightly smaller than a tube 4.

[0060] Drawing 15 is the sectional view having shown the condition of having inserted the tube 4 in the hole 35 and the tube joint material 37 of the body shown by drawing 14. Inside 39' of the tube joint material 37 is pushed on a tube 4, and is mostly displaced in the straight-line gestalt. Outside 38' of the tube joint material 37 is performing the variation rate, imitating along with the mating face 36 of the hole 35 of a body in connection with the variation rate of inside 39'.

[0061] The leakage control from the storage room of the liquid by two or more projections which can be set in the 2nd example shown by drawing 3 and drawing 4 for explaining to a detail about this example below, or a gas to the open air is forced on the hole of a body, a projection outer diameter spreading at the time of tube insertion. Therefore, when an ingredient with strong frictional resistance is especially used for tube joint material, the wrinkling and opening 43 of the tube path of insertion which the breadth of a projection outer diameter is checked in the part which touched the hole of a body early, and are shown in drawing 1616 may occur. Such a wrinkling and an opening 43 of the tube path of insertion tend to have a bad influence on the leakage control from the storage room 40 of a liquid or a gas to the open air 41.

[0062] On the other hand, in fitting of the curved-surface configuration shown by drawing 14 and drawing 15, a curved surface spreads also in the tube path of insertion with an outer diameter at the time of tube insertion. Therefore, even if it uses an ingredient with high frictional resistance for tube joint material, the wrinkling in the tube path of insertion and the vertical plane which are shown in drawing 17, or generating of an opening can be pressed down.

[0063] The wrinkling or opening of the tube path of insertion and a vertical plane cannot affect the leakage control from the storage room 40 of a liquid or a gas to the open air easily.

Therefore, in order to improve adhesion of a tube and tube joint material, and adhesion of tube joint material and a body hole, it is effective when using ** tube joint material and tube joint material with especially big frictional resistance.

[0064] As mentioned above, although explained about the 8th example from the 1st example, what is necessary is just the matter with which, as for tube joint material, it has flexibility in any case. Moreover, tube joint material can demonstrate the same effectiveness, whether it is generally joined to the hole or dissociates. Furthermore, it is also an effective means to compound and use the approach stated in the eighth example from the first example.

[0065] (Example 9) Drawing 18 is a perspective view for explanation at the time of using this invention for the ink supply to the ink discharge head of the ink jet printer which can print an alphabetic character and an image from an ink tank by making ink breathe out this invention mentioned above.

[0066] The printing section 42 of an ink jet printer consists of an ink discharge head 43, an ink tank 44, and tubes 45, 46, 47, and 48 for supplying ink to the ink discharge head 43 from the ink tank 44. The ink discharge head 43 consists of very small holes which are not illustrated and which were located in a line two or more pieces possible [the regurgitation / the ink of four colors] in the direction of arrow-head in drawing J. In order to supply ink, the holes 50, 51, 52, and 53 for ink supply are formed in the field 49 of the ink discharge head 43.

[0067] In this example, the hole 53 of the for the ink of a MAZENDA color and for supply in the

hole 52 of the for yellow ink and for supply in the hole 51 for black ink and supply in the hole 50 for supply is set as the feed holes of the ink of a cyanogen color. The ink tank 44 is constituted by the black tank 54, the yellow tank 55, the MAZENDA color ink tank 56, and the cyanogen color ink tank 57 according to the ink of four colors used for printing. Moreover, in addition it is constituted by the tube 45 for black, the tube 55 for yellow, the tube 56 for MAZENDA colors, and the tube 57 for cyanogen colors according to four colors used for printing like [a tube] an ink tank, the tube is incorporated with the feed holes of an ink discharge head and an ink tank through the tube joint material 58 of this invention.

[0068] Each approaches, the tube is arranged and it is especially understood in the ink discharge head 43 that it must pipe densely so that clearly from drawing 18 .

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the 1st example of the tube junction approach concerning this invention.

[Drawing 2] It is the sectional view showing the time of inserting a tube in the 1st example of this invention.

[Drawing 3] It is the sectional view showing the 2nd example of the tube junction approach concerning this invention.

[Drawing 4] It is the sectional view showing the time of inserting a tube in the 2nd example of this invention.

[Drawing 5] It is the perspective view showing the tube joint material in the 2nd example of the tube junction approach concerning this invention.

[Drawing 6] It is the perspective view showing the 3rd example of this invention.

[Drawing 7] It is the expanded sectional view of a tube joint material point showing the 4th example of the tube junction approach concerning this invention.

[Drawing 8] In the 4th example of this invention, it is the sectional view showing the time of inserting a tube.

[Drawing 9] It is the sectional view showing the 5th example of the tube junction approach concerning this invention.

[Drawing 10] It is the sectional view showing the time of inserting a tube in the 5th example of this invention.

[Drawing 11] It is the sectional view showing the 6th example of the tube junction approach concerning this invention.

[Drawing 12] It is the sectional view showing the time of inserting a tube in the 6th example of this invention.

[Drawing 13] It is the sectional view showing the 7th example of the tube junction approach concerning this invention.

[Drawing 14] It is the sectional view showing the 8th example of this invention.

[Drawing 15] It is the sectional view showing the 8th example of this invention.

[Drawing 16] It is the perspective view showing the 8th example of this invention.

[Drawing 17] It is the perspective view showing the 8th example of this invention.

[Drawing 18] It is an explanatory view when using this invention for an ink jet printer.

[Drawing 19] It is the sectional view showing the conventional example.

[Description of Notations]

1 Body

1a Hole

2 Tube Joint Material

4 Tube

7 Tube Joint Material

8 Projection

10 Sinking Comb Projection

11 Sinking Comb Projection

15 Projection Point

16 Projection Point

19 Slot

22 Projection

100 Body

101 Hole

102 Tube

103 Sealant

104 Storage Room

105 Open Air

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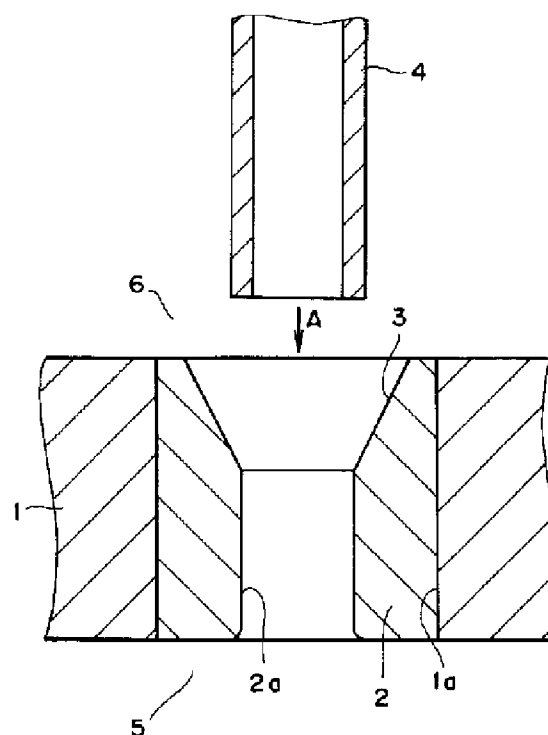
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(54) 【発明の名称】 チューブ接合方法

(57) 【要約】

【課題】 液体または気体等の媒体の搬送を行う複写機等のインクジェット記録装置のチューブの配管においては、本体の孔にチューブを接合する際に、シール材を用いると、組立後の待ち時間を必要とし、圧入式接合方法では、微細な位置決めや力の加え方の加減が必要とされ、自動化できない。

【解決手段】 取付けるべき本体の孔に対してチューブ接合部材を介してチューブを取付けて使用するために、チューブ接合部材のチューブ挿入孔をチューブ外径よりも径の小さい孔により構成したり、円筒状の切り込みや円筒状突起、或いは溝を設けたりすることを特徴とする。



【特許請求の範囲】

【請求項１】 取付けるべき本体の孔に対してチューブ接合部材を介してチューブを取付けるチューブ接合方法において、チューブ接合部材のチューブ挿入孔をチューブ外径よりも径の小さい孔により構成することを特徴とするチューブ接合方法。

【請求項２】 チューブ接合部材の外径にチューブ挿入方向と垂直に、円筒状の切り込みを形成することを特徴とする請求項１記載のチューブ接合方法。

【請求項３】 チューブ挿入方向と垂直に形成される円筒状の切り込みが複数個設けられたことを特徴とする請求項１記載のチューブ接合方法。

【請求項４】 チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起の少なくとも一つを、チューブ挿入方向に分割することを特徴とする請求項３記載のチューブ接合方法。

【請求項５】 チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端部を凹面上に構成することを特徴とする請求項１乃至４いずれか１項記載のチューブ接合方法。

【請求項６】 チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端のチューブ挿入方向ほぼ中央部に溝を構成することを特徴とする請求項５記載のチューブ接合方法。

【請求項７】 チューブ接合部材の外周に突起を設けると共に、チューブ接合部材が挿入される本体の孔の一部に、前記チューブ接合部材の突起と嵌合する溝を有することを特徴とする請求項６記載のチューブ接合方法。

【請求項８】 チューブの外周に外径より径の大きい突起を設けると共に、チューブ接合部材の内径の一部に、前記チューブの突起と嵌合する溝を有することを特徴とする請求項７記載のチューブ接合方法。

【請求項９】 取付本体の孔に対してチューブ接合部材を介してチューブを組み付けて使用する装置において、取付孔をチューブ挿入方向に対して曲面に形成すると共に、取付本体孔と接するチューブ接合部材面を、取付本体孔の曲面より僅かに曲率の大きな曲面にて構成し、且つチューブ接合部材にチューブの外径より僅かに小さい径の孔を有することを特徴とする請求項１記載のチューブ接合方法。

【請求項１０】 インクを吐出させることにより文字または画像を印字可能なインクジェットプリンターのインクタンクとインク吐出ヘッドの連結に使用されることを特徴とするチューブ接合方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】 本発明はインクジェット記録

装置の液体または気体等の媒体の搬送をチューブを用いて行う装置のチューブ接合方法、特に、インクを吐出させることによって文字または画像を印字するインクジェット記録装置のインクタンクとインク吐出ヘッドの接合方法に関するものである。

【０００２】

【従来の技術】 従来、液体または気体等の媒体の搬送を行うインクジェット記録装置等のプリンタにおいて、インク吐出ヘッドと液体または気体の供給部とを繋ぐために、チューブを配管する作業が行われている。このような従来におけるチューブの組立方法の一例として、例えば図１９に示される接合方法がある。

【０００３】 図１９に示されるように、従来の方法においては、本体１００に穿設された孔１０１に、液体または気体の媒体を搬送するチューブ１０２が挿入された後に、シリコンやエポキシ樹脂等の封止材、すなわちシール材１０３が本体１００の孔１０１とチューブ１０２との間の隙間に充填され、本体１００内外の保管室１０４と外気１０５との間が密封遮断されて液体または気体の漏洩が防止される。

【０００４】

【発明が解決しようとする課題】 しかしながら、このような図１９に示される従来の方法によれば、液状のシール材１０３を使用するために、封止作業中に、シール材１０３が本体１００の孔１０１とチューブ１０２との間の隙間からチューブ１０２内に回り込み、液体または気体中に混入する等の問題が見られた。加えて、シール材１０３は固化する迄に数分から数時間の時間を要し、連続的に組立加工を行う場合に、組立作業中に部品を保管場所に一時保管して十分な硬化養生を行わなければならない。

【０００５】 また、上述したシール材によらずに、直接にチューブ１０２を本体１００の孔１０１内に圧入する圧入式接合方法もあるが、チューブ１０２の外径および本体１００の孔１０１の内径を正確に管理しないと、液体や気体の漏れを起こす等の問題が見られる。

【０００６】 加えて、チューブ１０２を固い本体１００に圧入する圧入式接合方法は、本体１００にチューブ１０２を差し込む時にチューブ１０２への微細な位置決めと、力の加え方をしなければ組立ができないので、組み込み作業の自動化が極めて困難である。

【０００７】 従って、本発明の目的はこのような従来における問題を解決するために、シール材により接合する方法で必要な組立後の待ち時間を必要とせず、且つ圧入式接合方法で要求される、微細な位置決めや力の加え方の加減を必要とせず、チューブを容易に挿入できる自動的な組立に適したチューブの接合方法を提供することにある。

【０００８】

【課題を解決するための手段】 上述の目的を達成するた

めに、本発明のチューブ接合方法は、取付けるべき本体の孔に対してチューブ接合部材を介してチューブを取付けるチューブ接合方法において、チューブ接合部材のチューブ挿入孔をチューブ外径よりも径の小さい孔により構成することを特徴とする。

【０００９】また、本発明のチューブ接合方法は、チューブ接合部材の外径にチューブ挿入方向と垂直に、円筒状の切り込みを形成することを特徴とする。

【００１０】更に、本発明のチューブ接合方法は、チューブ挿入方向と垂直に形成される円筒状の切り込みが複数個設けられたことを特徴とする。

【００１１】更にまた、本発明のチューブ接合方法は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起の少なくとも一つを、チューブ挿入方向に分割することを特徴とする。

【００１２】なおまた、本発明のチューブ接合方法は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端部を凹面上に構成することを特徴とする。

【００１３】本発明のチューブ接合方法は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端のチューブ挿入方向ほぼ中央部に溝を構成することを特徴とする。

【００１４】また、本発明のチューブ接合方法は、チューブ接合部材の外周に突起を設けると共に、チューブ接合部材が挿入される本体の孔の一部に、前記チューブ接合部材の突起と嵌合する溝を有することを特徴とする。

【００１５】更に、本発明のチューブ接合方法は、チューブの外周に外径より径の大きい突起を設けると共に、チューブ接合部材の内径の一部に、前記チューブの突起と嵌合する溝を有することを特徴とする。

【００１６】更にまた、本発明のチューブ接合方法は、取付本体の孔に対してチューブ接合部材を介してチューブを組み付けて使用する装置において、取付孔をチューブ挿入方向に対して曲面に形成すると共に、取付本体孔と接するチューブ接合部材面を、取付本体孔の曲面より僅かに曲率の大きな曲面にて構成し、且つチューブ接合部材にチューブの外径より僅かに小さい径の孔を有することを特徴とする。

【００１７】なおまた、本発明のチューブ接合方法は、インクを吐出させることにより文字または画像を印字可能なインクジェットプリンターのインクタンクとインク吐出ヘッドの連結に使用されることを特徴とする。

【００１８】この様に、本発明によれば、チューブ接合方法は、上記のような構成によって、取り付けるべき本体の孔に対してチューブ接合部材を介してチューブを取付けて使用するチューブ接合方法において、チューブ接合部材またはチューブ挿入孔をチューブ外径よりを幾分

小さい孔により構成しているので、チューブを孔に挿入するだけで、チューブとチューブ接合部材、およびチューブ接合部材と本体の孔を隙間なく組立てることが可能となり、更に、チューブの挿入が容易になるので、作業能率が上がり作業コストの低減が可能となり、また、組立装置も容易な装置で組立が可能のために、装置への設備費用も低減可能となるし、自動組立機械の使用が容易になり、低コスト、大量生産への対応も容易となり、更にまた、上記装置においてチューブ接合部材の外径にチューブ挿入方向と垂直に切り込みを形成することによりチューブ接合部の変位許容量を増大させ、もってチューブとチューブ接合部材のクリアランス許容範囲を増大可能とし、チューブやチューブ接合部材および本体孔の寸法許容差を拡げることが可能となり、部品の加工を容易にする効果があり、かつ部品の加工を容易にすることにより部品の品質管理も容易になり、加えて部品コストの低減に効果がある。更に、チューブ接合部材にチューブ挿入方向と垂直に複数個の切り込みを形成することにより、チューブ挿入方向と垂直な複数の面において、液体や気体が保管室から外気への漏洩防止を複数段で行うことが可能となり、これによって、より確実な漏洩防止を可能とすることができる。

【００１９】また、上記実施例を複合して使用することによって、チューブの挿入動作だけで、本体の取付孔とチューブ接合部材、およびチューブ接合部材とチューブの固定を可能とし、同時に液体や気体が保管室から外気へ漏洩防止を行うことを可能とすることができる。

【００２０】このような本発明を、インクを吐出させることにより、文字または画像を印字可能なインクジェットプリンターのインクタンクとインク吐出ヘッドの連結に使用した場合の効果に就いて説明を行うに、インクを吐出させることにより、文字または画像を印字可能なインクジェットプリンターのインクとインク吐出ヘッドの連結における特徴として、狭い配置間隔、生産量が多いこと、低コストの三点が挙げられる。以下に、これらに就いて順に説明を行う。

【００２１】近年のインクジェットプリンターはカラー画像の印刷も可能であり、複数の色に対応した複数のインク吐出ヘッドを有しており、従って、インク供給用チューブも同様に複数必要とされている。更に、インク吐出部は複数の色に対応したインク吐出ヘッドが集積した構造をしているので、特に、インク吐出ヘッドへのインク供給チューブは狭い間隔で配置しなければならない。加えて、インクジェットプリンター用のヘッドは、月に数百万個を量産する量産性を求められる。更に、近年の市場での価格低下に対応して、より低コストでの組立が求められている。

【００２２】以上のような要求項目に対して、本発明は、チューブ挿入作業のみでインクタンクとインク吐出ヘッド間を連結可能なので、複数本のチューブを狭い間

隔で配置可能であり、更にまた、単純な動作での組立が可能であるので、容易に自動化が行え、加えて終了までに時間を要する接着工程を不要とするので、大量生産への対応が可能となる。更に、簡易な機構の自動機械で組立が可能であり、作業時間も早いことと相俟って組立コストの低減も図ることができる。

【0023】本発明のその他の目的や特徴および利点は添付図面に沿っての以下の詳細な説明から明らかになるう。

【0024】

【発明の実施の形態】以下に、本発明のチューブ接合法の好ましい実施の形態に就いて図面を参照して詳細に説明する。

【0025】（実施例1）図1および図2は本発明に係るチューブ接合法の第1の実施例を示す断面図である。

【0026】図示されるように、本発明のチューブ接合法においては、ほぼ円筒状のチューブ接合部材2が本体1に設けられた孔1aに適宜な接着剤を用いて固着されており、このチューブ接合部材2の孔2aにチューブ4が挿入されて取付けられる。

【0027】本実施例において、本体1は硬質プラスチック材料で作られるのが好適であり、その他、塩化ビニールやフッ素樹脂、金属、木材等、適宜な硬質の材料で作られている。

【0028】また、チューブ接合部材2はシリコンゴムやウレタンゴム等の弾性部材により構成され、チューブ4を挿入して取付けるための孔2aと、チューブ挿入方向（図中矢印A方向）にチューブ4をガイドするための適宜なテーパが付けられた傾斜面3とが形成されている。チューブ4は円管状の形状をしており、ポリエチレンやポリプロピレンまたは塩化ビニールや銅等の金属材料、少なくともチューブ接合部材2と同等か、より固い材料で作られるのが好適である。

【0029】このような本体1、チューブ接合部材2およびチューブ4によって、先ず、図1に示されるように、本体1の孔1aにチューブ接合部材2が固着された状態で、チューブ4を矢印A方向に挿入することにより、チューブ接合部材2は孔2aの内径がチューブ4の外径の大きさに拡張されて、図2の状態に密着した状態に取付けられる。

【0030】従って、図2の状態では、チューブ接合部材2は、弾性部材によって構成されているために、図1の状態に戻ろうとする復元力を有するので、チューブ4を周りから押し付ける方向に押圧力を作用してチューブ接合部材2とチューブ4との間の隙間を埋めて水密に保ち、これによって保管室5から外気6へ液体または気体の漏洩を防止することが可能となる。

【0031】（実施例2）図3および図4は本発明に係るチューブ接合法の第2の実施例を示す断面図で、図

1に示した第1の実施例と同一の部材には同一の符号が付けられ、且つ同じ材料で作られている。従って、本実施例において、本体1は硬質プラスチック材料や塩化ビニール、フッ素樹脂、金属、木材等、適宜な硬質の材料で作られ、チューブ接合部材2はシリコンゴムやウレタンゴム等の弾性部材により作られ、チューブ4はポリエチレンやポリプロピレンまたは塩化ビニールや銅等の金属材料等で作られる。

【0032】図3において、ほぼ円筒状のチューブ接合部材7は本体1の孔1aと大体接する面に環状、すなわちリング状の突起8および空隙9を有するよう形成されている。このように構成された第2の実施例において、図中矢印A方向にチューブ4を挿入すると、図4の状態になる。図示されるように、チューブ4をチューブ接合部材7に挿入した状態では、チューブ接合部材7の内径はチューブ4の外径まで拡張される。従って、突起8は本体の孔1に押し付けられて変形する。チューブ接合部材7は、シリコンゴムやウレタンゴム等の弾性部材により構成されているために、図3の状態に戻ろうとする復元力を有するので、突起8はチューブ接合部材7を本体の孔1に押し付けつつ、突起8と同一面上の接合部材7がチューブ4に接する位置10でチューブ接合部材7をしっかりとチューブ4に押し付ける。

【0033】すなわち、チューブ4の挿入動作のみで、チューブ4とチューブ接合部材7およびチューブ接合部材7と本体1の孔1aの夫々の間での押し付け力を得ることが可能となって密着保持され、これによって保管室5から外気6への液体または気体の漏洩が防止される。

【0034】図5は上述のチューブ接合部材7の一例を示す斜視図である。本実施例では突起8は三段リング状に形成されており、リング状の突起8が三段に構成されている。

【0035】すなわち、本実施例ではチューブ接合部材7は三段のリング状の突起8によって本体1の孔1aおよびチューブ4へ押し付けられることにより、保管室5と外気6を三重に遮断することが可能となる。従って、チューブ4を挿入する単純な組立作業のみで、チューブ4とチューブ接合部材7および、チューブ接合部材7と本体1の孔1aは複数段で遮蔽され、これによって保管室5から外気6への液体または気体の漏洩を防止することが可能となる。

【0036】（実施例3）図6は図5に示されたリング状の突起8を、更に複数に切り分けた、くし歯状の突起11、12を用いた第3の実施例を示す図である。本実施例においても、本体1は硬質プラスチック材料や塩化ビニール、フッ素樹脂、金属、木材等、適宜な硬質の材料で作られ、チューブ接合部材2はシリコンゴムやウレタンゴム等の弾性部材により作られる。

【0037】封止される液体や気体、あるいはチューブ接合部材、チューブの材質や硬度により、ごく希に、図

5に示されるリング状の多段仕切りでも、押し付け圧力が不均一になり、封止性能を低下させる危険性があり得るので、その防止対策として本実施例では図6に示されるように、リング状の突起を部分的に欠落させた、くし歯状の突起11、12をチューブ接合部材7に設けたものである。

【0038】図5で示されるリング状の多段仕切りにおいて、押し付け圧力が不均一になる原因は、チューブ挿入時にチューブ接合部材7が理想的なチューブ接合部材7の広がりに対応した均一な広がり方をせず、局部的な部分のみが広がることに起因している。

【0039】次に、このような局部的な部分のみが広がる現象を詳細に説明する。

【0040】図3および図4において、チューブ4のチューブ接合部材7への挿入に当たって、作業時の力の加え方、チューブ4およびチューブ接合部材7の偏心や材料硬度のバラツキにより、本体1に対して理想的な広がり方をせず、一部分が早く広がり、加えて、チューブ接合部材7と本体1の孔との摩擦力が大きい場合には早く広がった一部分に変位が集中して発生することがある。

【0041】一方、図5に示される、リング状の突起8では、一部分が早く広がり、加えて、チューブ接合部材7と本体の孔との摩擦力が大きい場合に、早く広がった一部分に変位が集中しても、図6に示される実施例では、くし歯状の突起11、12が、円周方向へも変位可能なので、円周方向に均一な圧力分布を形成することが可能となる。

【0042】尚、図6に示されるように、複数段のくし歯状の突起11、12を設ける場合には、チューブ接合部材7の中心から回転方向（図中矢印B、C方向）に、お互いの突起11、12の位置が成る可く重なり合わないよう突起11、12の位置をずらして配置するよう構成した方が望ましい。

【0043】また、図5に示されるリング状の突起8と図6に示されるくし歯状の突起11、12は、封止する媒体の性質や、チューブ接合部材やチューブの材質硬度に応じて使い分ければ良いが、一般的には、上記説明にも有ったように、チューブ接合部材と本体の孔の摩擦係数が高い材料を使用した時には、くし歯状の突起が有効である。

【0044】（実施例4）図7および図8は、本発明を利用した、図3、図4におけるチューブ接合部材の突起8の先端部の変形例である本発明の第4の実施例を示す断面図である。本実施例においても、本体1は硬質プラスチック材料や塩化ビニール、フッ素樹脂、金属、木材等、適宜な硬質の材料で作られ、チューブ接合部材はシリコンゴムやウレタンゴム等の弾性部材により作られる。

【0045】図7はチューブ接合部材が本体の孔に挿入

されていない状態のチューブ接合部材の突起14の先端部を示した断面図である。図示されるように、突起14の先端部15、16は、肉厚方向（図中矢印D、E方向）中心に向かって、夫々図7で示されるテーパ面を有している。

【0046】図8は図7で示されたチューブ接合部材7が、本体1の孔1aに組み込まれて、チューブ4が挿入された時の、チューブ接合部材7の突起14'を示す断面図である。

【0047】この状態において、突起14'は本体1の孔1aへ押し付けられるために図中矢印D、E方向の肉厚方向ほぼ中央より矢印D側は、矢印D方向へ広がり、他方、矢印E側は、矢印E方向へ広がっている。

【0048】この結果、図7におけるテーパ面15、16はチューブ組立後には図8に示されるように、本体1の孔1aに広い面で密着した状態を保つことができる。

【0049】また、突起14のテーパ面15、16の合流部17には図8に示すようなV字状の切り込み或いはU字状の切り込みまたは溝等の逃げ部を設けている。これら逃げ部17を設けることにより、図8に示されるチューブ組立後のチューブ接合部材の突起先端部14'のほぼ中央部17'での盛り上りを防止して、テーパ面15'、16'の密着を一層高めることができる。

【0050】（実施例5）図9は本発明の第5の実施例を示す断面図であり、本実施例では、本体は硬質プラスチック材料や塩化ビニール、フッ素樹脂、金属、木材等、適宜な硬質の材料で作られ、本体の孔18は溝19と切り欠き20を有している。

【0051】着脱自在なチューブ接合部材21はシリコンゴムやウレタンゴム等の弾性部材により作られ、本体孔18の溝19と嵌合可能な位置決め突起22と、切り欠き20に嵌合して突き当たる、突き当て突起23とを有している。チューブ接合部材21のガイド面24は、チューブ4をチューブ接合部材21へ矢印G方向から挿入する時のガイド面となっている。また、チューブ接合部材21の当たり面25は、チューブ4を挿入した時に広がり、外周部にある突起22を本体孔18に引っ掛ける突起22を溝19に嵌合させる。

【0052】以上のように構成することにより、チューブ接合部材21を本体の孔18へ矢印G方向から挿入した後に、チューブ4を矢印G方向から挿入することによって、図10に示されるように、チューブ接合部材21を本体の孔18へ固定すると共に、液体または気体が、保管室から外気へ漏洩することを防止することができる。これら一連の動作は全て矢印G方向からのみで行うことができ、また、同一動作で、チューブ接合部材21の固定および封止を可能としている。従って、本発明は自動機械での組立時に特に有効となる。

【0053】（実施例6）図11は本発明の第6の実施例を示す断面図である。

【0054】本実施例において、本体は硬質プラスチック材料や塩化ビニール、フッ素樹脂、金属、木材等、適宜な硬質の材料で作られている。更に、チューブ接合部材28はシリコンゴムやウレタンゴム等の弾性部材により作られ、チューブ嵌合溝29を有している。チューブ30はチューブ外径より径の大きな、嵌合突起31を有している。ここで矢印H方向へチューブ30を挿入すると、図12に示されるように、チューブ30の突起はチューブ接合部材28の嵌合溝29へ位置決めされる。すなわち、一連の動作はすべて矢印H方向からのみで行うことができ、また、同一動作で、チューブ30とチューブ接合部材28間の固定および封止を可能としている。

【0055】（実施例7）図13は本発明の第7の実施例を示す断面図である。本実施例では、本体1は硬質プラスチック等で作られ、チューブ接合部材32はシリコンゴムやウレタンゴム等の弾性部材により作られ、本体1の孔1aと異なる位置にチューブ嵌合溝33を有している。従って、チューブ34の突起35は、本体1の孔1aと異なる位置にてチューブ接合部材32と図13に示されるように固定されている。

【0056】図13においては、チューブ34の突起35が、チューブ接合部材32の嵌合溝33と本体1の孔1aにチューブ接合部材32の外径に規制されない位置にて、矢印F方向より挿入可能なので図11に示した第6の実施例より弱い力で組立てることができる。

【0057】また、第6の実施例と同様に一連の動作は全て矢印I方向からのみで行うことができると共に、同一動作で、チューブ接合部材32の固定および封止を可能としている。

【0058】（実施例8）図14および図15は本発明の第8の実施例を示す断面図である。図14において、本実施例では、本体は硬質プラスチック等で作られ、チューブ接合部材37シリコンゴムやウレタンゴム等の弾性部材により作られていて、チューブ4はチューブ接合部材37と接合される。本体の孔35の本体合わせ面36は図14に示されるように曲面で形成されている。他方、チューブ接合部材37は本体の孔35と接する外面を本体の孔35の内面の曲面より曲率の大きな面で構成されている。従って、チューブ4の挿入前はチューブ接合部材37と本体の孔35の間には隙間42が生じている。

【0059】チューブ接合部材37の、チューブ4が挿入される内面39は、チューブ4より僅かに小さな径で構成されている。

【0060】図15は図14で示された本体の孔35およびチューブ接合部材37にチューブ4を挿入した状態を示した断面図である。チューブ接合部材37の内面39'はチューブ4に押されてほぼ直線形態に変位している。チューブ接合部材37の外面38'は内面39'の変位に伴い本体の孔35の合わせ面36に沿って倣いな

がら変位を行っている。

【0061】以下に、本実施例に就いて詳細に説明するに、図3および図4で示される第2の実施例における複数の突起による液体または気体の保管室から外気への漏洩防止は、チューブ挿入時に突起外径が広がりつつ本体の孔に押し付けられる。従って、特に、チューブ接合部材に摩擦抵抗の強い材料を使用したときには、本体の孔と早く接した部分で突起外径の広がりが阻害されて図16に示すチューブ挿入方向のしわや空隙43が発生することがある。このようなチューブ挿入方向のしわや空隙43は、液体や気体の保管室40から外気41への漏洩防止に悪影響を与えやすい。

【0062】一方、図14および図15で示される曲面形状の嵌合においては、チューブ挿入時に曲面が外径と共にチューブ挿入方向にも広がる。従って、チューブ接合部材に摩擦抵抗の高い材料を使用しても、図17に示されるチューブ挿入方向と垂直面でのしわ或いは空隙の発生を押さえることができる。

【0063】チューブ挿入方向と垂直面のしわ或いは、空隙は、液体や気体の保管室40から外気への漏洩防止に影響を与え難い。従って、チューブとチューブ接合部材の密着およびチューブ接合部材と本体孔の密着を良くするために、柔チューブ接合部材、特に、摩擦抵抗の大きなチューブ接合部材を使用するときに効果がある。

【0064】以上、第1の実施例から第8の実施例に就いて説明したが、いずれの場合もチューブ接合部材は柔軟性を有する物質であればよい。また、チューブ接合部材は大体孔に接合されていても、或いは分離されていても同様の効果を発揮可能である。更に、第一の実施例から第八の実施例で述べた方法を、複合して使用することも有効な手段である。

【0065】（実施例9）図18は、上述した本発明を、インクを吐出させることにより文字や画像を印字可能なインクジェットプリンターの、インクタンクからインク吐出ヘッドへのインク供給に、本発明を使用した場合の説明のための斜視図である。

【0066】インクジェットプリンターの印字部42は、インク吐出ヘッド43とインクタンク44と、インクタンク44からインク吐出ヘッド43へインクを供給するためのチューブ45、46、47、48とから構成されている。インク吐出ヘッド43は図示されない複数個並んだ微少な孔より図中矢印J方向に4色のインクを吐出可能に構成されている。インクを供給するために、インク吐出ヘッド43の面49には、インク供給用の孔50、51、52、53が設けられている。

【0067】本実施例では、供給用の孔50が黒色インク、供給用の孔51が黄色のインク、供給用の孔52がマゼンダ色のインク、供給用の孔53がシアン色のインクの供給孔に設定されている。インクタンク44は、印刷に使用される4色のインクに合わせて、黒色タンク5

4、黄色タンク55、マゼンダ色インクタンク56、シアン色インクタンク57により構成されている。また、チューブもインクタンクと同様に印刷に使用される4色に合わせて、黒色用チューブ45、黄色用チューブ55、マゼンダ色用チューブ56、シアン色用チューブ57により構成されている、尚、チューブは、本発明のチューブ接合部材58を介してインク吐出ヘッドおよびインクタンクの供給孔と組み込まれている。

【0068】図18から明らかなように、チューブはおのおのが近接して配置されており、特に、インク吐出ヘッド43において、密集して配管を行わなければならないことが理解される。

【0069】

【発明の効果】以上説明したように、本発明の請求項1記載のチューブ接合方法は、取付けるべき本体の孔に対してチューブ接合部材を介してチューブを取付けるチューブ接合方法において、チューブ接合部材のチューブ挿入孔をチューブ外径よりも径の小さい孔により構成しているので、チューブを本体の孔に挿入するだけで、チューブとチューブ接合部材およびチューブ接合部材と、大体孔を隙間なく組み立てることが可能となり、更に、上述のように、チューブの挿入が容易になるので、作業効率が向上され作業コストの低減が可能になると共に、組立装置も簡易な装置で組立が可能となるために装置への設備費用も低減可能となり、更に、自動組立機械の使用が容易になり、低コスト、大量生産への対応も容易となる。

【0070】本発明の請求項2記載のチューブ接合方法は、チューブ接合部材の外径にチューブ挿入方向と垂直に、円筒状の切り込みを形成しているので、チューブ接合部の変位許容量を増大させ、チューブとチューブ接合部材や本体孔の寸法許容差を広げることが可能となり、部品の加工を容易にする効果があり、このように部品の加工を容易にすることにより部品の品質管理も容易となり、加えて部品コストの低減に効果がある。

【0071】本発明の請求項3記載のチューブ接合方法は、チューブ挿入方向と垂直に形成される円筒状の切り込みが複数個設けられているので、チューブ挿入方向と垂直な複数の面において、液体や気体が保管室から外気への漏洩防止を複数段で行うことが可能になり、これによって確実な漏洩防止を可能とすることができる。

【0072】本発明の請求項4記載のチューブ接合方法は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起の少なくとも一つを、チューブ挿入方向に分割しているので、摩擦抵抗の大きなチューブ接合部材においても円周上の押し付け力を円周方向に均等にすることを可能とし、これによって確実な漏洩防止を可能とすることができる。

【0073】本発明の請求項5記載のチューブ接合方法

は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端部を凹面上に構成しているので、チューブ接合部材の本体孔への接触面積を増加させて、更に、確実な液体や気体が保管室から外気への漏洩防止を行うことができる。

【0074】本発明の請求項6記載のチューブ接合方法は、チューブ接合部材のチューブ挿入方向と垂直に形成される円筒状の切り込みにより形成される円筒状突起外径先端のチューブ挿入方向ほぼ中央部に溝を構成しているので、チューブ挿入後にチューブ接合部材の突起が中央で膨らみ、空隙を生じることを防止することにより、液体や気体が保管室から外気へ漏洩防止を一層確実に可能となる。

【0075】本発明の請求項7記載のチューブ接合方法は、チューブ接合部材の外周に突起を設けると共に、チューブ接合部材が挿入される本体の孔の一部に、前記チューブ接合部材の突起と嵌合する溝を有しているので、チューブ挿入時のチューブ接合部材の外径の拡張変位を利用してチューブ接合部材を上記溝に挿入させることによってチューブ接合部材を、チューブの挿入のみで、本体の孔に固定することが可能になる。

【0076】本発明の請求項8記載のチューブ接合方法は、チューブの外周に外径より径の大きい突起を設けると共に、チューブ接合部材の内径の一部に、前記チューブの突起と嵌合する溝を有しているので、チューブを挿入するのみで、チューブをチューブ接合部材に対して、固定することが可能になる。

【0077】本発明の請求項9記載のチューブ接合方法は、取付本体の孔に対してチューブ接合部材を介してチューブを組み付けて使用する装置において、取付孔をチューブ挿入方向に対して曲面に形成すると共に、取付本体孔と接するチューブ接合部材面を、取付本体孔の曲面より僅かに曲率の大きな曲面にて構成し、且つチューブ接合部材にチューブの外径より僅かに小さい径の孔を有しているので、本体孔とチューブ接合部材間のチューブ挿入方向の空隙を防止して液体や気体が保管室から外気へ漏洩防止をより確実に可能となる。

【0078】本発明の請求項10記載のチューブ接合方法は、インクを吐出させることにより文字または画像を印字可能なインクジェットプリンターのインクタンクとインク吐出ヘッドの連結に使用しているので、インクを吐出させることにより文字または画像を印字可能なインクジェットプリンターのインクタンクとインク吐出ヘッドの連結に利用できる。また、チューブの挿入作業のみでインクタンクとインク吐出ヘッドの間を連結することができるので、複数本のチューブを狭い間隔で配置可能で、かつ単純な動作での組立が可能であり、大量生産への対応が可能で、更に、安易な機構の自動機で組立が可能であり、作業時間も早いことと相俟って組立コストの

低減を図ることができる。

【0079】更に、上記実施例を複合して使用することにより、チューブの挿入動作のみで本体の取付孔とチューブ接合部材および、チューブ接合部材とチューブの固定を可能とし、同時に液体や気体が保管室から外気へ漏洩防止をより確実に可能となる。

【図面の簡単な説明】

【図1】本発明に係るチューブ接合方法の第1の実施例を示す断面図である。

【図2】本発明の第1の実施例においてチューブを挿入したときを示す断面図である。

【図3】本発明に係るチューブ接合方法の第2の実施例を示す断面図である。

【図4】本発明の第2の実施例においてチューブを挿入したときを示す断面図である。

【図5】本発明に係るチューブ接合方法の第2の実施例におけるチューブ接合部材を示す斜視図である。

【図6】本発明の第3の実施例を示す斜視図である。

【図7】本発明に係るチューブ接合方法の第4の実施例を示す、チューブ接合部材先端部の拡大断面図である。

【図8】本発明の第4の実施例において、チューブを挿入したときを示す断面図である。

【図9】本発明に係るチューブ接合方法の第5の実施例を示す断面図である。

【図10】本発明の第5の実施例においてチューブを挿入したときを示す断面図である。

【図11】本発明に係るチューブ接合方法の第6の実施例を示す断面図である。

【図12】本発明の第6の実施例においてチューブを挿

入したときを示す断面図である。

【図13】本発明に係るチューブ接合方法の第7の実施例を示す断面図である。

【図14】本発明の第8の実施例を示す断面図である。

【図15】本発明の第8の実施例を示す断面図である。

【図16】本発明の第8の実施例を示す斜視図である。

【図17】本発明の第8の実施例を示す斜視図である。

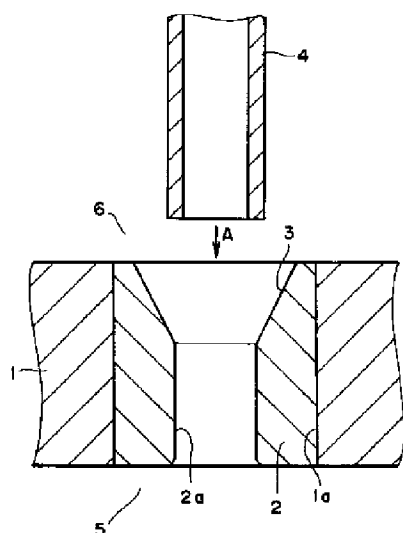
【図18】本発明をインクジェットプリンターに使用した時の説明図である。

【図19】従来例を示す断面図である。

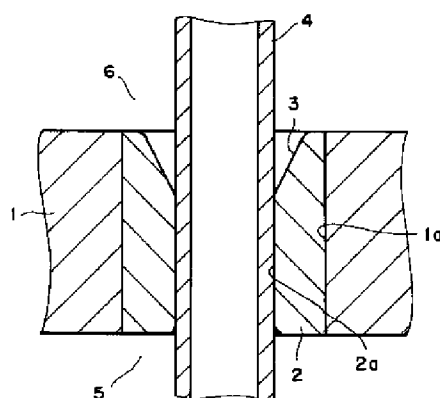
【符号の説明】

- 1 本体
- 1a 孔
- 2 チューブ接合部材
- 4 チューブ
- 7 チューブ接合部材
- 8 突起
- 10 くし歯突起
- 11 くし歯突起
- 15 突起先端部
- 16 突起先端部
- 19 溝
- 22 突起
- 100 本体
- 101 孔
- 102 チューブ
- 103 シール材
- 104 保管室
- 105 外気

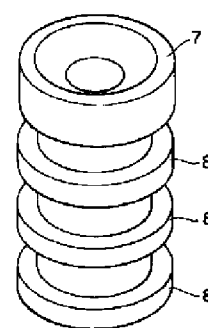
【図1】



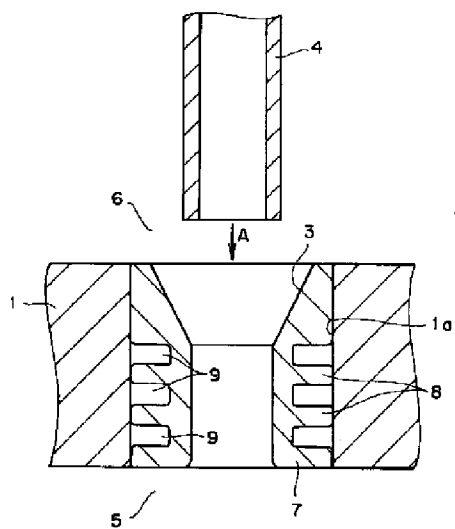
【図2】



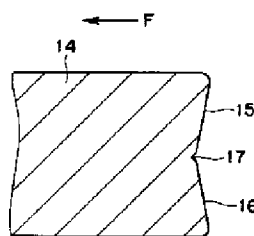
【図5】



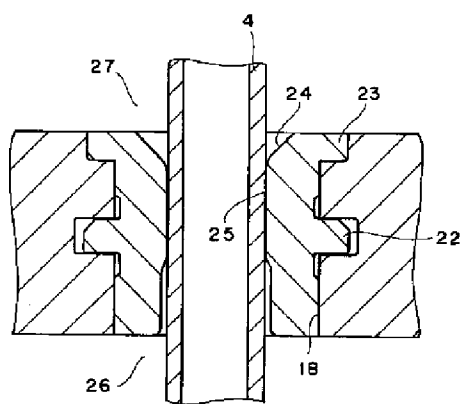
【図3】



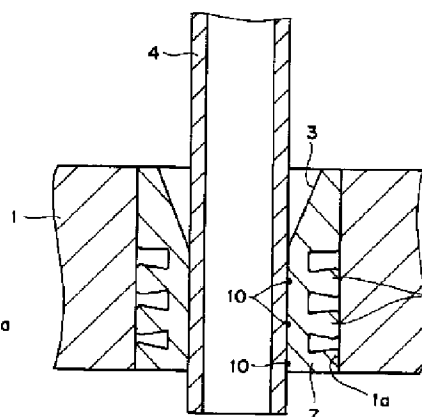
【図7】



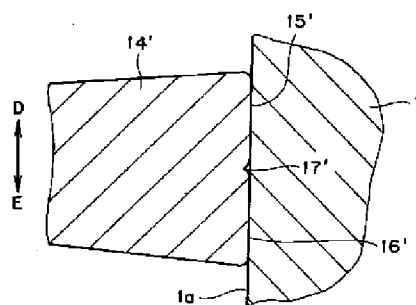
【図10】



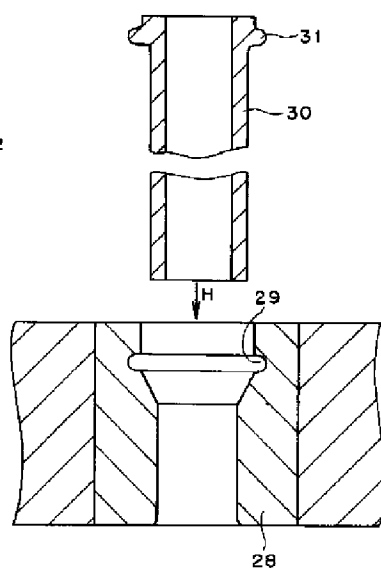
【図4】



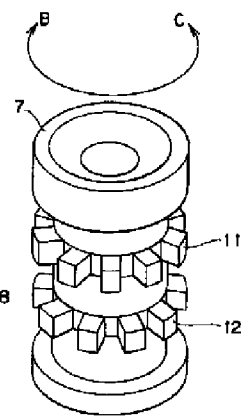
【図8】



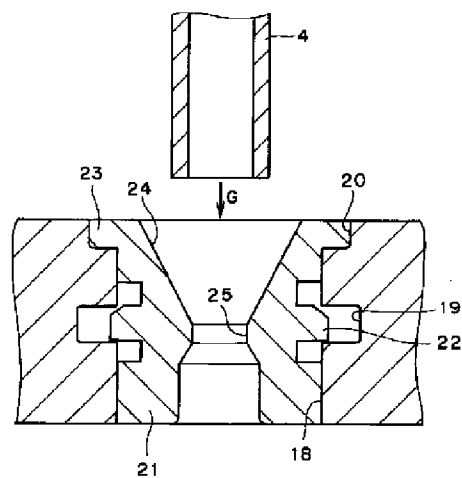
【図11】



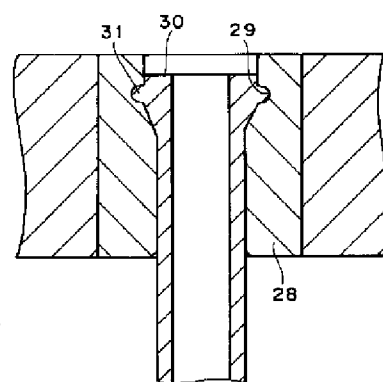
【図6】



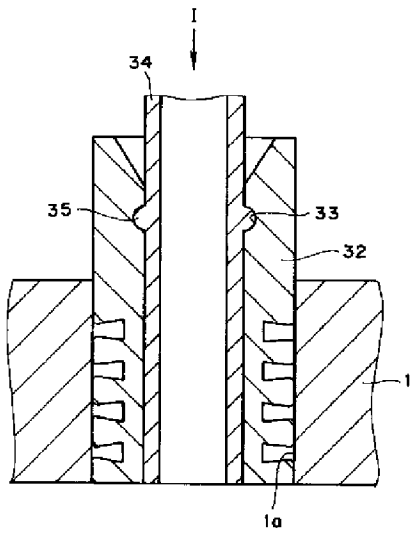
【図9】



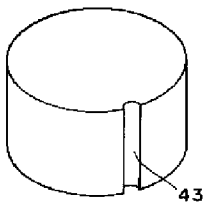
【図12】



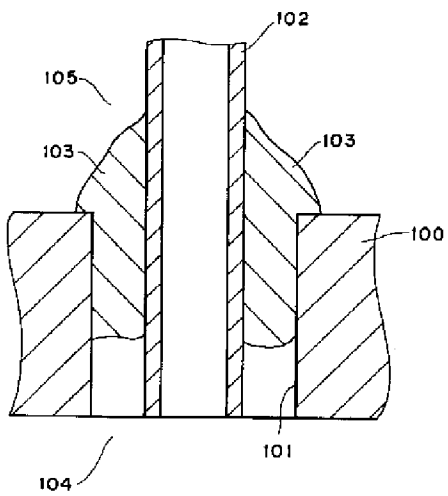
【図13】



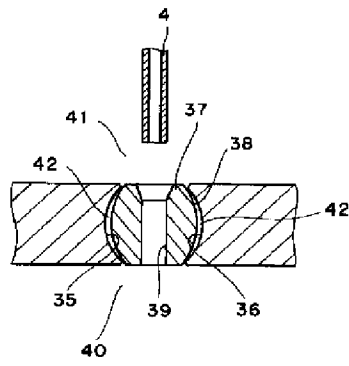
【図16】



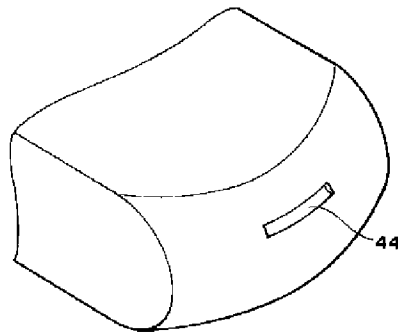
【図19】



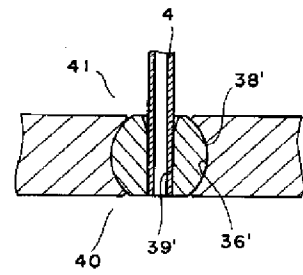
【図14】



【図17】



【図15】



【図18】

